FIELD ASSESSMENT
1950 BRIGANTINE DRIVE, COQUITLAM BC

Prepared for:

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PKS11466
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Andrew Allan	Kiewit	#	✓
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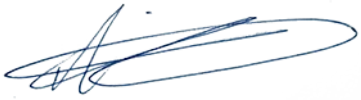
AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by	
1	First version of 1950 Brigantine Drive Field Assessment	20220624	Stewart Wright Project Director	Alasdair Lindop Project Manager
2	Second version of 1950 Brigantine Drive Field Assessment	20220708	 Stewart Wright Project Director	 Alasdair Lindop Project Manager

1.0 INTRODUCTION

Peter Kiewit Sons ULC (Kiewit) has retained Hatfield Consultants LLP (Hatfield) to provide a field assessment of their property and leased waterlot along the south side of the Fraser River at 1950 Brigantine Drive, Coquitlam, BC (the Site). Prior to Kiewit's ownership, the Site was used as a log sorting facility. Kiewit intend to convert the Site into a marine yard and use it for barge storage, loading, and unloading (the Project). As such, a field assessment is required to support permit applications including, but not limited to, a Fisheries Act Authorization administered by the Fisheries and Oceans Canada (DFO) and a Project and Environment Review administered by the Vancouver Fraser Port Authority.

This report outlines the results of a desktop review and field assessment completed on the terrestrial, intertidal, and subtidal habitats and species present on the Site. This information will be used to inform regulatory requirements, including the assessment of potential Project impacts, mitigation measures, and offsetting planning. The findings may also be used as input to planning and design; specifically, to support the identification of environmental constraints and mitigation.

2.0 SITE AND PROJECT DESCRIPTION

The Project is located in the City of Coquitlam along the north side of the Fraser River at the east end of Sapperton Channel, approximately 2.2 km downstream of the Port Mann Bridge (Figure 1). The Site encompasses the entirety of the Kiewit property.

The terrestrial portion of the Site is highly disturbed as it was previously used as a log sorting facility for approximately 30 years. The terrestrial portion includes aquatic elements, consisting of three derelict sumps filled with freshwater. The leased waterlot is also highly disturbed due to historical dredging and industrial activity. It is influenced by tides, with outflow from the Fraser River dominating and the upper boundary of the Fraser River salt wedge at the western end of Sapperton Channel. Thus, the leased waterlot is freshwater.

The lower Fraser River is an important habitat for several vulnerable species whose stocks are in general decline, including migrating Pacific salmon, sturgeon and eulachon. The area also has traditional importance for Indigenous groups who's territory overlaps the lower Fraser River, and continues to support Indigenous fisheries.

Kiewit intends to convert the property into a marine yard. The first stage will entail maintenance dredging in the intertidal area and the removal and relocation of existing piles to accommodate marine equipment (e.g., barges). The second stage will entail the construction of a bulkhead able to receive barges. Works for the bulkhead development will include dredging and infill into the waterlot.

Figure 1 Location of Project Site and surrounding features .

Legend

- Property
- Waterlot Lease
- Trans Mountain Pipeline
- Parks
- Watercourse

Data Sources:
a) Site areas, Kiewit 2022.
b) Parks, City of Coquitlam 2022.
c) Watercourse, Fresh Water Atlas 2012.
d) Site area image, 2cm, Kiewit 2022.
e) Aerial image, 10cm, 13 April 2021, Esri Online Service.

0 50 100 200 m

N

Scale: 1:10,000

Projection: NAD 1983 UTM Zone 10N

Hatfield

Fraser River Barge Facility Permitting

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3.0 ASSESSMENT METHODS

A desktop review and field assessment were completed to characterize the ecology of the Site. This included an assessment of terrestrial, riparian, and aquatic habitats and features (e.g., substrates, wildlife trees, anthropogenic structures, other features used for breeding, resting, foraging, etc.), and associated species (e.g., plants, fish, wildlife, invertebrates, introduced species and those at risk). During the field assessment the boundaries of habitats were mapped, and habitat suitability evaluations were completed for select inconspicuous, sensitive, or at-risk species that potentially may use the Site or are in proximity to it.

3.1 DESKTOP REVIEW

A desktop review of the following publicly available online sources was completed prior to the field assessment to obtain best available information on the ecology within and up to 1 km from the Site. The list of species at risk, i.e., listed provincially by the Conservation Data Centre or federally under Canada's *Species at Risk Act* (SARA) obtained was refined to include only those species that are known to or likely to occur in the area based on current habitat conditions.

- Habitat wizard (BC Ministry of Environment and Climate Change Strategy [BC MOECCS] 2022a);
- BC species and ecosystem explorer (BC MOECCS 2022b);
- BC great blue heron atlas (Community Mapping Network (CMN) 2022a);
- BC wetlands atlas (CMN 2022b);
- eBird Canada (eBird 2022);
- Federal registry for species listed under SARA (Government of Canada 2022);
- Fraser River Estuary Management Plant (FREMP) habitat atlas (CMN 2022c);
- Frogwatch BC (BC Ministry of Environment 2022);
- Georgia basin habitat atlas (CMN 2022d);
- iNaturalist Canada (Canadian Wildlife Federation et al. 2022);
- Sensitive Habitat Inventory and Mapping Atlas (SHIM) (CMN 2022e);
- Stewardship Project Registry Atlas (CMN 2022f); and
- Wildlife Tree Stewardship Atlas (CMN 2022g);

3.2 FIELD ASSESSMENT

A field assessment of the Site, including down to the low water mark of the waterlot, was completed on May 19, 2021 by three Hatfield staff. The assessment was conducted between 11:00 am and 5:00 pm on a diurnal low tide. Weather consisted of 75% cloud cover, no precipitation, light winds, and an average temperature of approximately 15 °C.

The main focus of the assessment was to characterize aquatic and terrestrial habitats and species present within and adjacent to the Site property and waterlot. This included ground truthing the boundaries of distinct habitat types (e.g., terrestrial, subtidal, intertidal, riparian) using a handheld global positioning system (GPS with a ± 2.0m accuracy), assessing habitats for species at risk and other wildlife (e.g., breeding sites, overwintering areas), and documenting introduced and invasive species. Photos and GPS coordinates were collected to further document Site conditions.

Because of the highly disturbed nature of the intertidal area within the waterlot, qualitatively assessment of sediments, supported by sediment sampling completed for a related Disposal at Sea application, is sufficient to characterize intertidal habitats without conducting a quantitative survey. Physical substrate characteristics observed are described according to the categories presented in Table 1 (DFO 1990). Due to turbidity in the Fraser River, a towed camera subtidal survey was not suitable, and the subtidal assessment was based on a desktop assessment, bathymetric survey, and sediment analysis of the subtidal footprint.

Table 1 Substrate categories used in assessing intertidal habitats.

Substrate	Definition	Size (mm)
Fines: silt, clay, mud	Loose sedimentary deposit	<0.0625
Fines: sand	Loose granular material	0.0625 – 2
Gravel	Loose fragments of rock	2 – 64
Cobble	Loose stone larger than gravel, smaller than a boulder	64 – 256
Boulder	Detached mass of rock	>256
Coarse organic	Surface layers dominated by loose accumulations of small woody debris	2 – 64

4.0 DESKTOP AND FIELD ASSESSMENT RESULTS

4.1 PROJECT SITE HISTORY

The Site has been in industrial use and altered since the 1950s, when the northern portion of the Site was part of a landfill that was actively filling from the 1950s to the 1970s. Clearing and filling of the Site, including the foreshore, took place in stages, between 1974 and 1989 (PGL 2022a, Appendix A1).

Prior to purchase by Kiewit, the upland Site was occupied by a log sorting operator continuously since the 1990s. Aerial photographs indicate that logs have been boomed within the current waterlot since at least 1946 (Figure 2 and Figure 3). Logs continued to be present and visible by satellite throughout the time period until the most recent image in 2021(Figure 4). The logs were removed upon transfer of the waterlot lease to Kiewit in early 2022.

Figure 2 1950 Brigantine Drive, 1946.

Source: PGL (2022)

Figure 3 1950 Brigantine Drive, 1949.

Source: PGL (2022)

Figure 4 1950 Brigantine Drive, 2021.

Image from Google Earth. Lines show property boundary and waterlot

4.2 TERRESTRIAL

4.2.1 Vegetation

The Site falls within the Coastal Western Hemlock biogeoclimatic zone, Dry Maritime subzone and the Fraser Lowland Ecosection, Lower Mainland Ecoregion, and Georgia Depression Ecoprovince (Province of BC 2022). This area is represented by warm dry summers and cool falls (Province of BC 2022).

Surrounding the Site along its western boundary are two natural areas, Pacific Reach Linear Park and Don Roberts Park Trails, both owned by the City of Coquitlam and surrounded by applicable Streamside Protection and Enhancement Area (SPEA) setbacks to protect fish habitat associated with Como Creek (Figure 1, City of Coquitlam 2022a). Just north of the Site, towards its eastern boundary, is a SPEA that surrounds a waterbody on property 2000 Brigantine Dr. The presence of an above ground watercourse flowing between this area, the Site, and the Fraser River was not observed during the field assessment. According to the City of Coquitlam's mapping the SPEA does not extend into the Site (City of Coquitlam 2022a). Along the eastern boundary of the Site is another natural area, the Fraser River Greenway – Foreshore and Natural Areas (Figure 1, City of Coquitlam 2022a). The next closest large natural areas to the Site are the Coquitlam River Wildlife Management Area and Colony Farm Regional Park, both approximately 1.7 to 2.0 km east of the Site along the north side of the Fraser River (Figure 1). These natural areas contain lowland foreshore, freshwater, riparian, forest, and grassland habitats (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development 2022).

A review of the CMN SHIM, British Columbia Wetlands, and Georgia Basin Habitat Atlas' (CMN 2022x, 2022b, 2022x) did not indicate any sensitive terrestrial habitats or freshwater wetlands within or in proximity to the

Site. Six fisheries enhancement (e.g., stewardship, restoration) or study (e.g., stock assessment) projects have been conducted near the south end of Como Creek near the western boundary of the Site (CMN 2022x).

The majority of the upland portion of the Site is flat and disturbed from past land use, consisting of paved and compacted areas with little to no vegetation cover or habitat for wildlife (Table 2, Photos 1 to 3). The southern side of the Site along the Fraser River is partially vegetated (i.e., sections more vegetated than others) with differing species (Table 3) and structure and is classified as foreshore riparian habitat (Figure 5).

The eastern end of the Site along the foreshore consisted of intact mature deciduous forest (Table 2, Photos 4 to 5) bordered by upland bench riparian habitat (Table 2, Photos 6 to 7). West of this area the central portion of the Site consists of varying types and sizes of terrestrial habitats, all early serial stage (Table 2, Photos 8 to 14). The eastern portion of the Site contains more intact vegetation that is more mature but still young forest and is directly connected to Don Roberts Park Trails and then Pacific Reach Linear Park to the west (Table 2, Photos 15 to 17).

Figure 5 Project site and habitats.

Legend

Project Components
- Property Boundary
- Waterlot Lease Boundary

Terrestrial Habitats
- Riparian
- Boulder
- Paved Surface Area

Intertidal Habitats
- Fines
- Coarse Organic

Data Sources:
a) Project components, Kiewit 2022.
b) Habitats, Hatfield 2022.
c) Site area image, 2cm, Kiewit 2022.
d) Background image, aerial photo, 10cm, 13 April 2021, Esri Online Service.

0 50 100 150 m

N

Scale: 1:5,000

Projection: NAD 1983 UTM Zone 10N

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Fraser River Barge Facility Permitting

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Table 2 Photographs of terrestrial habitats and vegetation observed at the Site on May 19, 2022.

Photo 1 East end of Site with disturbed area in foreground and mature forest habitat in background.

Photo 2 Center area of Site looking east.

Photo 3 Upper terrestrial portion of Site looking west. Note: vegetated berm in background and trees are not within the Site.

Photo 4 East end of Site showing mature intact deciduous forest.

Photo 5 East end of Site showing mature intact deciduous forest with wildlife trees.

Photo 6 Foreshore upland bench riparian habitat at east end of Site looking east.

Table 2 (Cont'd.)

Photo 7 Foreshore upland bench riparian habitat at east end of Site looking west.

Photo 8 Example of habitat transition between upland disturbed area and riparian foreshore looking east from southwest corner of Site.

Photo 9 Foreshore habitat along center east portion of Site looking northeast.

Photo 10 Foreshore habitat along center west portion of Site looking northwest.

Photo 11 Foreshore habitat at east end of Site near Trans Mountain pipeline crossing.

Photo 12 Dense shrub dominated riparian foreshore habitat looking west near center of Site.

Table 2 (Cont'd.)

Photo 13 Young shrub and tree riparian foreshore habitat looking west near center of Site.

Photo 14 Terrestrial and intertidal foreshore habitats looking east from the western end of Site.

Photo 15 Terrestrial and intertidal foreshore habitats looking west from the western end of Site.

Photo 16 Terrestrial and intertidal foreshore habitats looking east from the western end of Site.

Photo 17 Terrestrial and intertidal foreshore habitats looking west from the western end of Site.

Table 3 List of native terrestrial vegetation species observed within the Site on May 19, 2022.

Group	Common Name	Scientific Name
Tree	Black cottonwood	*Populus trichocarpa*
Tree	Red alder	*Alnus rubra*
Tree	Bitter cherry	*Prunus emarginata*
Shrub	Willow species	*Salix* species
Shrub	Red-osier dogwood	*Cornus sericea*
Shrub	Red elderberry	*Sambucus racemosa* var. *arborescens*
Shrub	Black hawthorn	*Crataegus douglasii*
Shrub	Black twinberry	*Lonicera involucrata* var. *involucrata*
Shrub	Pacific ninebark	*Physocarpus capitatus*
Shrub	Snowberry	*Symphoricarpos albus*
Shrub	Baldhip rose	*Rosa gymnocarpa* var. *gymnocarpa*
Shrub	Tall Oregon-grape	*Mahonia aquifolium*
Shrub	Hardhack	*Spiraea douglasii* var. *douglasii*
Forb/herb	Western dock	*Rumex occidentalis*
Forb/herb	Common horsetail	*Equisetum arvense*
Forb/herb	Kinnikinnick	*Arctostaphylos uva-ursi*
Forb/herb	Bird's-foot trefoil	*Lotus corniculatus*
Forb/herb	Common Silverweed	*Potentilla anserina* ssp. *anserina*
Forb/herb	Thistle sp.	*Cirsium* species
Fern	Sword fern	*Polystichum munitum*
Fern	Lady fern	*Athyrium filix-femina*
Grass	Foxtail barley	*Hordeum jubatum* ssp. *jubatum*

4.2.2 Introduced Species

A number of introduced plant species occur within 1km of the Site (BC Ministry of Environment and Climate Change Strategy (BC MOECCS) 2022a), some of which are regulated under BC's *Weed Control Act* (Province of British Columbia 2022) and Weed Control Regulation (Province of British Columbia 2022) (Table 4).

Introduced plant species found within the Site included Himalayan blackberry, Scotch broom, Japanese knotweed, butterfly bush (*Buddleja davidii*), European bittersweet (*Solanum dulcamara*), reed canarygrass (*Phalaris arundinacea*), broadleaved dock (*Rumex obtusifolius*), herb robert (*Geranium robertianum*), and common tansy (*Tanacetum vulgare*).

The species of most concern on the Site with regards to difficulty managing and potential spread is Japanese knotweed. This species was observed in the northwest corner of the Site adjacent to a small freshwater sump and an active work area just to the east (Table 5). The area this species occupied measured approximately 10 m by 5 m.

The BC *Weed Control Act* works to control the spread of designated noxious plants on provincial Crown and private lands. Under the Act, landowners or occupiers have an obligation to control (i.e., avoid the establishment and dispersal of noxious weeds) designated noxious plants.

Table 4 Non-native aquatic and terrestrial plant species found within 1km of the Project Site

Common Name	Scientific Name	Status [a]	Class
European water-purslane	*Lythrum portula*	Introduced	Aquatic
Russian olive	*Elaeagnus angustifolia*	Introduced	Aquatic
Weeping alkaligrass	*Puccinellia distans*	Introduced	Aquatic
Clustered dock	*Rumex conglomeratus*	Introduced	Aquatic
Waxy mannagrass	*Glyceria declinata*	Introduced	Aquatic
Northern bog St. John's-wort	*Hypericum boreale*	Species of concern	Aquatic
	Cyprinus carpio	Carp	Aquatic
English ivy	*Hedera helix*	Introduced	Terrestrial
Himalayan blackberry	*Rubus armeniacus*	Introduced	Terrestrial
Scotch broom	*Cytisus scoparius*	Species of concern	Terrestrial
Cutleaf blackberry	*Rubus laciniatus*	Introduced	Terrestrial
Bull thistle	*Cirsium vulgare*	Species of concern	Terrestrial
Common tansy	*Tanacetum vulgare*	Introduced	Terrestrial
Wild chervil	*Anthriscus sylvestris*	Regionally noxious (Fraser Valley region)	Terrestrial
Bohemian knotweed	*Fallopia x bohemicum*	Noxious	Terrestrial
Tree of heaven	*Ailanthus altissima*	Introduced	Terrestrial
Japanese knotweed	*Fallopia japonica*	Noxious	Terrestrial
English holly	*Ilex aquifolium*	Introduced	Terrestrial

[a] The status of plant species is based on designations provided by Habitat wizard (BC MOECCS]) 2022a) and/or BC's *Weed Control Act*.

Table 5 Photographs of invasive species observed at the Site on May 19, 2022.

Photo 1 **Japanese knotweed surrounding sump in northwest corner of Site.**

Photo 2 **Japanese knotweed in northwest corner of Site on edge and in wood debris.**

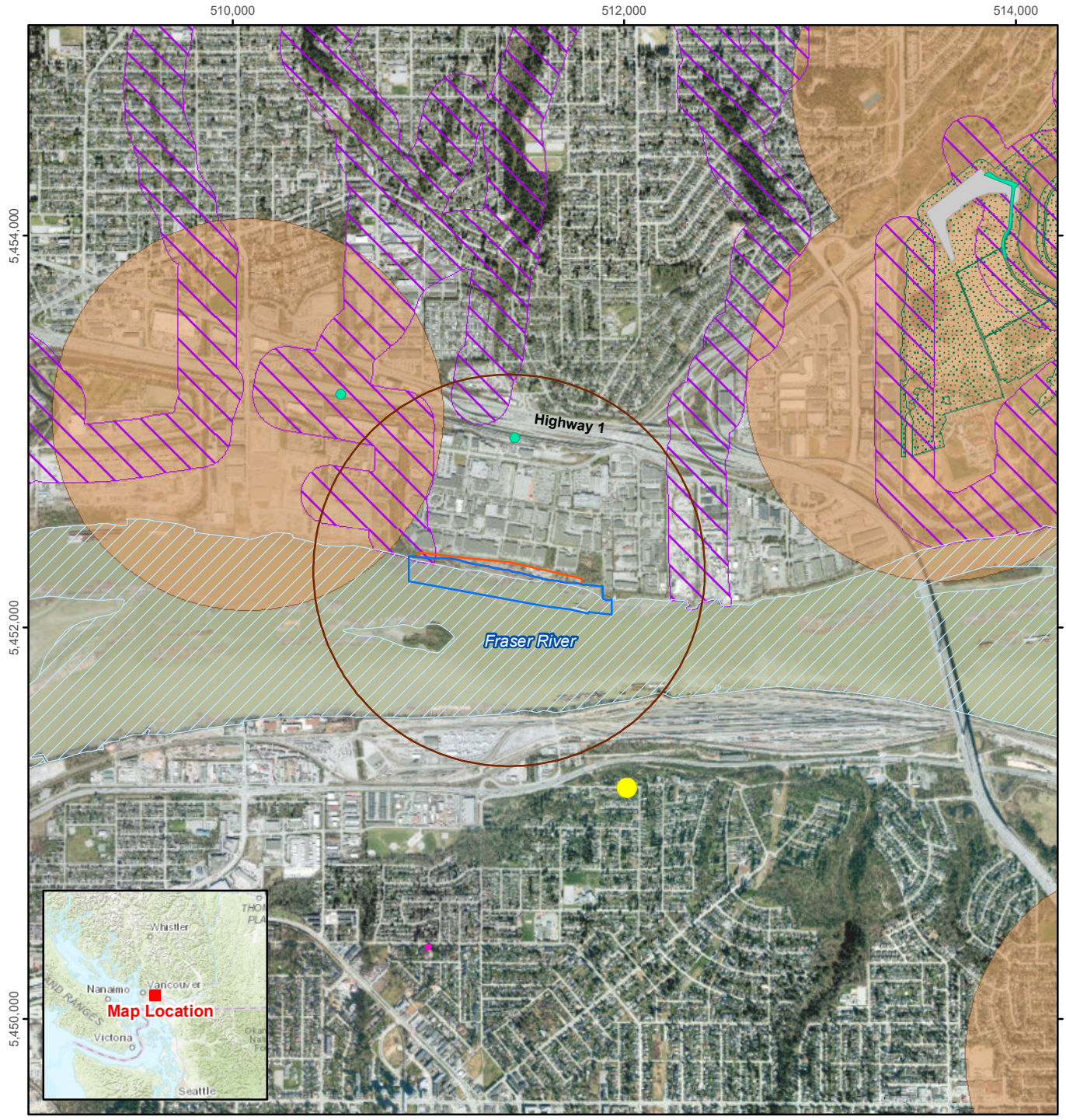
4.2.3 Wildlife

4.2.3.1 Species at Risk

No species at risk have been documented within the Site. The Northern painted turtle (*Chrysemys picta bellii*) – Pacific Coast Population and barn owl (*Tyto alba*) – Western Population are two species that have been recorded and/or have critical habitat within 1 km of the Site (Figure 6, Table 6, BC MOECCS 2022a, (Environment and Climate Change Canada 2021a and 2021b). Oregon forestsnail (*Allogona townsendiana*, provincially red listed, federally endangered), pink water speedwell (*Veronica catenate*, provincially blue listed), and snowshoe hare – Washingtonii subspecies (*Lepus americanus washingtonii*, provincially red listed) are all documented within 5 km of the Site (Figure 6, BC MOECCS 2022a). The Site falls with critical habitat for marbled murrelet (*Brachyramphus marmoratus*) but the habitat present in and around the Site do not contain the biophysical attributes to support this species. Other species at risk that have the potential to use or occur around the Site are listed in Table 7.

From a habitat suitability perspective, the Site contains limited suitable habitat for most of the species at risk identified in the surrounding area and those that have the potential to occur within the Site. The exceptions to this are the following: foraging in intertidal areas and/or roosting or nesting in mature trees at the southeast end of the Site by great blue heron (*Ardea herodias fannini*), foraging and nesting by common nighthawk (*Chordeiles minor*), foraging and resting by peregrine falcon (*Falco peregrinus anatum or pealei*), foraging and nesting by barn swallow (*Hirundo rustica*), and resting by double crested cormorant (*Phalacrocorax auratus*).

Figure 6 Species at risk critical habitat and known occurrences in and within 1km of the Project footprint.



Legend

Project Components

- Project Property Boundary
- Waterlot Lease Boundary
- 1km Buffer Around Project Center

Federal Critical Habitat

- Oregon Forestsnail (Final)
- Northern Painted Turtle - Pacific Coast Population (Final)
- Barn Owl - Western Population (Proposed)

Species at Risk Occurances

- Northern Painted Turtle - Pacific Coast Population
- Oregon Forestsnail
- Pink Water Speedwell
- Snowshoe Hare, Washingtonii Subspecies
- White Sturgeon - Lower Fraser River Population

0 200 400 800 m

N

Scale: 1:30,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:

a) Federal critical habitat and species at risk occurances, BC Open Data, downloaded June 2022.
b) Project boundaries, Kiewit 2022.
c) Aerial image, 10cm, 13 April 2021, Esri Online Service.

Hatfield

Fraser River Barge Facility Permitting

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Table 6 Terrestrial species of concern with the potential to occur within or near the Project site.

Common Name	Scientific Name	BC List[1]	SARA Status[2]
Northern painted turtle – Pacific Coast Population	*Chrysemys picta* pop. 1	Red	Endangered
Barn owl – Western Population	*Tyto alba*	Red	Threatened

[1] BC List: Red = species that are extirpated, endangered, or threatened; Blue = species that are of special concern.

[2] Schedule 1 of SARA is the official list of species at risk in Canada. It includes species that are extirpated, endangered, threatened, and of special concern,

Table 7 Species at risk that may use or occur around the Site.

Common Name	Scientific Name	BC List[a]	Committee on the Status of Endangered Wildlife in Canada (COSEWIC)[b]	SARA[b]
Great blue heron	*Ardea herodias fannini*	B	SC	SC
Common nighthawk	*Chordeiles minor*	Y	SC	T
Peregrine falcon	*Falco peregrinus anatum or pealei*	R or B	NAR or SC	SC
Double-crested cormorant	*Phalacrocorax auratus*	B	NAR	
Barn swallow	*Hirundo rustica*	B	SC	T

[a] Y = yellow, B = blue, R = red, [b] T = threatened, E = endangered, SC = special concern, NAR = not at risk

4.2.3.2 Mammals

No mammals have been documented at the Site within iNaturalist Canada (Canadian Wildlife Federation et al. 2022) and the only sign of mammal use was old feeding by American beaver (*Castor canadensis*). The Site likely supports small rodents such as house mouse (*Mus musculus*) and brown rat (*Rattus norvegicus*).

4.2.3.3 Birds

The desktop assessment indicated the following with regards to birds around the Project area.

One bald eagle (*Haliaeetus leucocephalus*) nest (ID: BAEA-204-055) was documented on April 12, 2015 on the south side of the Fraser River approximately 1.4 km southeast of the Project (UTM: 10 512230 5451277, CMN 2022c).

The following breeding colonies for great blue heron (*Ardea herodias fannini*) have been documented in proximity to the Site but are all currently inactive (CMN 2022a):

- Colony ID: GBHE-208-038, active from 1960 to 2016, UTM 10 509500 5453000 (approximate location) 2 km to north west;
- Colony ID: GBHE-208-013, active from 1973 to 1997, UTM 10 514400 5453150 +/-100m, 3.3 km to the north east; and
- Colony ID GBHE-208-005, active from 1992 to 2016, UTM 10 514370 5452788 +/-100m, 3.2 km to the east.

No bird species have been reported within the Site through eBird, but 66 species have been observed between July 1, 2008, and May 28, 2022, within Pacific Reach Linear Park to the northwest (eBird 2022).

A number of bird species were observed using the Site during the field assessment (Table 8), all of which are common and not at risk. One young Canada goose was observed dead within one of the sump ponds near the center of the Site (Table 9, Photo 1). A series of dead trees and pilings were observed at the Site that were or have supported wildlife use (e.g., feeding, nesting) (Table 9).

Table 8 List of bird species observed within the Site on May 19, 2022.

Common Name	Scientific Name	Activity
Song sparrow	*Melospiza melodia*	Foraging, potential breeding
Wilson's warbler	*Cardellina pusilla*	Foraging, potential breeding
Northern flicker	*Colaptes auratus*	Foraging, breeding
Canada goose	*Branta canadensis*	Breeding
Violet-green swallow	*Tachycineta thalassina*	Foraging, potential breeding
European starling	*Sturnus vulgaris*	Breeding
Mallard	*Anas platyrhynchos*	Foraging, potential breeding
Spotted sandpiper	*Actitis macularius*	Foraging
Killdeer	*Charadrius vociferus*	Foraging, likely breeding
Bald eagle	*Haliaeetus leucocephalus*	Flying
American crow	*Corvus brachyrhynchos*	Foraging, potential breeding
Glaucous-winged gull	*Larus glaucescens*	Flying, resting
Great blue heron, *fannini* subspecies	*Ardea herodias fannini*	Signs of foraging

Table 9 Photographs of wildlife habitat features observed at the Site on May 19, 2022.

Photo 1 **Young Canada goose observed dead within sump near center of Site.**

Photo 2 **Old wooden mooring pile with use by wildlife (i.e., foraging and nesting by birds in cavities).**

Table 9 (Cont'd.)

Photo 3 Old wooden mooring pile with use by wildlife (e.g., foraging and nesting by birds in cavities).

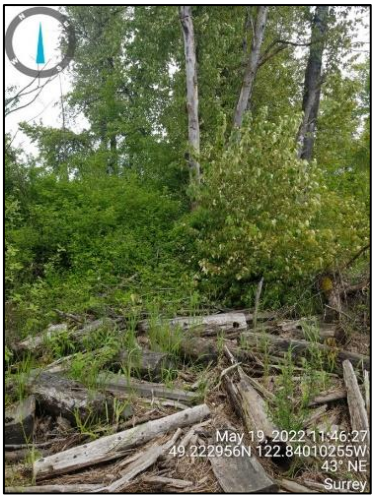


Photo 4 Wildlife trees present with signs of use in eastern forested area of Site.

4.2.3.4 Herptiles

No amphibians or reptiles have been documented within the Site through Frogwatch BC (BC Ministry of Environment 2022) or iNaturalist Canada (Canadian Wildlife Federation et al. 2022). Three garter snakes (*Thamnophis* species) were observed, one in the upper terrestrial area and two in the foreshore terrestrial area (Table 10, Photo 1). These individuals and others may overwinter (i.e., hibernacula) on the Site (e.g., within rip rap).

Table 10 Photograph of snake observed at the Site on May 19, 2022.

Photo 1 One of three garter snakes observed within the Site.

4.3 AQUATIC

4.3.1 Physical Conditions

Existing Site infrastructure includes a disused stationary log loader at the west end of the Site, and a concrete boat launch and barge loading platform at the east end of the Site. The shoreline adjacent the log loader is armoured with a sheetpile wall, running 40 m along the shoreline (Table 11). The foreshore area beyond the sheetpile has been dredged to -2.0 m CD to allow barge access. The boat ramp is approximately 10 m wide and extends into the subtidal zone. It's extensively cracked, and riprap applied on either side has been buried under fine and coarse woody debris. The barge loading platform is a rectangular structure that protrudes approximately 1,800 m^2 from the foreshore. Riprap has been placed on the east and west sides of the platform, but the eastern side is buried completely with woody debris and was not visible during the field assessment. The Site is bisected by an embayment containing a defunct stormwater discharge pipe, and an active stormwater sump. The sump receives surface runoff, while the discharge pipe has been blocked at its upstream side, and only receives seepage. A distinct channel carries combined flows from these discharges through the intertidal zone and into the Fraser River.

Table 11 Photographs of the Site, May 19, 2022.

Photo 1 Concrete Boat launch.

Photo 2 Log loader.

Photo 3 Surface water sump.

Photo 4 Channelized sump discharge.

While the entirety of the Site, including the sub and intertidal zones, have been modified since at least 1946 for log storage (Section 4.1), there is a small area of intertidal mudflat habitat. As the Site is upstream of the Fraser River salt wedge, it is not influenced by saltwater at any time of the year. Elevations range from 0.0 to 1.0 m chart datum (CD) (Figure 7). The transition from riparian to intertidal zone is steep throughout the length of the Site, with slope angles ranging from 30° to 90°. The breadth of the intertidal zone is variable, with large intertidal benches interspersed with narrow strips, extending 50 m to 10 m from shore, respectively. The transition from intertidal to subtidal is a steep bank descending from 0.0 m to -1.0 m CD, followed by a 40 m bench extending out to a CD of -2.0 m; depth then increases rapidly to -14.0 m CD.

Abandoned pile stubs, large woody debris, and collapsed timber dolphins are found across the Project area. Coarse organic material, derived from the Site's history as a log handling facility, is found in thick layers across the Site and incorporated within sediments. The dominant surface sediment throughout the intertidal was fine sand and silt (65% surface area), while coarse organic material was subdominant (33%). Sediment throughout the Site was stratified with alternating layers of fine woody debris. Large woody debris (LWD) was common throughout the Site, with the largest accumulations west of the stationary log handler (Table 12).

The eastern portion of the Site includes a 600 m^2 constructed marsh bench built in 1991 as part of a habitat compensation project. The bench foreshore is armoured with timber cribbing, which isolates the bench from river flows, and prevents sediment erosion. The bench is densely colonized by a variety of native shrubs and multiple species of *Carex spp.,* along with three invasive species (*Lythrum salicaria*, *Iris pseudacorus*, and *Phalaris arundinacea*), although invasive species represent less than 20% of total coverage.

Table 12 Site sediments, May 19, 2022.

Photo 1 Accumulations of fines and LWD in the upper intertidal zone.

Photo 2 Coarse woody debris covering the surface of the intertidal.

Table 12 (Cont'd.)

Photo 3 Surface collection of coarse woody debris in the intertidal.

Photo 4 Layers of coarse woody debris within intertidal sediment.

4.3.2 Vegetation

Intertidal vegetation was sparse throughout the Site, totaling approximately 350 m^2, with all rooted vegetation isolated to the high intertidal and spray zones. Vegetation was comprised of sedges, rushes, yellow flag iris, algae, was observed growing by the stormwater discharge channel (Table 13). No provincially or federally listed species at risk were identified.

Most vegetation was established in areas of the high intertidal, directly adjacent the riparian zone. Substrates in the lower intertidal had no observed vegetation besides a matt of unidentified algae growing below the surface water discharge.

Yellow flag iris was a substantial component of intertidal vegetation community. Yellow flag iris is an aggressive introduced species that outcompetes native plants and is documented to increase terrestrialization of floodplain benches (Gervazoni 2020). Yellow flag iris may have begun to exclude other native plant species from parts of the intertidal zone, limiting structure and function (e.g., shade, cover and large woody debris input for fish). As such, areas with yellow flag iris are considered to provide limited intertidal value.

Table 13 List of intertidal vegetation species observed within the Site on May 19, 2022.

Common Name	Scientific Name
Common cattail	*Typha latifolia*
Small-flowered bulrush	*Scirpus microcarpus*
Sitka sedge	*Carex sitchensis*
Seacoast bulrush	*Bolboschoenus maritimus ssp. paludosus*
Common rush	*Juncus hesperius*
Slough sedge	*Carex obnupta*
Scouring rush	*Equisetum hyemale ssp. affine*

Table 14 Photographs of intertidal vegetation present within the Site on May 19, 2022.

Photo 1 Terrestrialization of the intertidal by yellow flag iris.

Photo 2 Small patch of sedges growing within upper intertidal.

Photo 3 Sedges growing amongst coarse woody debris.

Photo 4 Intertidal vegetation proximal to the sump discharge.

4.3.2.1 Habitat classification

The FREMP shoreline classification system uses habitat values to grade areas by level of productivity (FREMP 2002). FREMP classifications include:

- "Green (low): Habitat Green coded habitats include areas where habitat features and functions are limited due to existing conditions (e.g., developed for port or other urbanized uses);
- Yellow (moderate): Yellow coded habitats include habitat features that are of moderate value in structure or diversity due to existing conditions (e.g. surrounding land uses or productivity) and support moderate fish and wildlife functions; and
- Red (high): Red coded habitats include productive and diverse habitat features that support critical fish and wildlife functions on-site or as part of a more regional context and/or areas where habitat compensation has been previously constructed to offset habitat losses."

FREMP categorizes the east third of the Site as low; the area directly adjacent the surface water discharge and Como Creek (which is outside of the Project footprint) high; the remainder of the Site shoreline as moderate. Further, FREMP classification identifies two areas of intertidal habitat: directly east of the surface water discharge and directly east of the boat ramp.

Comparing the Hatfield 2022 field assessment with the 2007 observations by FREMP, the Site has undergone significant changes. In 2022, there is significantly more mudflat habitat across the Site and noticeably less riparian and intertidal vegetation. The FREMP classification also identifies marsh vegetation associated with the surface water discharge intertidal zone. These results are distinctly different from the Hatfield 2022 field assessment, which found extremely limited areas of intertidal vegetation. The discrepancy may result from the cessation of dredging after the end of log handling activities. Dredging in this area, conducted to maintain navigability for barges and log handling, would have removed sediment from across the Site, particularly between Como Creek and the log loader – which is where mudflats are now observed. Additionally, dredging would have removed significant volumes of coarse woody debris (introduced from onshore log handling activities) from near-shore river sediments. While dredging has ceased, large stockpiles of coarse woody debris remain on the shoreline, intertidal, and riparian zones. This debris currently forms thick matts across much of the intertidal zone and is incorporated within intertidal sediments. Woody debris is likely reducing establishment of vegetation in two ways: mulching the sediment (i.e., preventing adequate sunlight from reaching establishing plants, and preventing dispersal of seeds to the sediment) and through tidal scour (i.e., the movement of woody debris over the sediment with each tidal fluctuation).

Current conditions are different enough to suggest that the FREMP shoreline categories are no longer accurate. Based on observed habitat values, Hatfield's estimate is that productivity throughout the Project shoreline is low, with a small section of moderate productivity area centered around the surface water discharge and water lot downstream of Como Creek, and high productivity associated with the constructed marsh bench.

4.3.3 Fish

4.3.3.1 Habitat

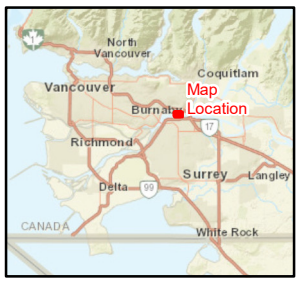
Riverbed morphology in the Lower Fraser River is highly dynamic, with sediment loads influenced by natural (e.g., upstream discharge, tides, freshet) and anthropogenic (e.g., dredging, prop scour) factors, both upstream and downstream of the Project area. Riverbed sediments in the Project area are comprised of silty loam with scattered large woody debris both above and below the river high watermark (see PGL Ltd. 2022b, Appendix A2).

Review of historic aerial photographs (PGL Ltd. 2022a, Appendix A1) indicates that both the intertidal and subtidal areas has been used for log booming since at least 1946 and mud flats are apparent along the entirety of the site. Dredging in the east section of the Site is visible from 1959 onward, with more extensive dredging following construction of the log handling facility (early 1990's). With the cessation of regular dredging, sediment has begun to accrue, and intertidal mudflats are observed (Section 4.3.3.2 for discussion). Generally, water depth within the Project limits is -1.0 to -14.0 m CD in the subtidal zone (Figure 7).

Figure 7 Site Bathymetry.

Legend

Contour (1 m)



0 25 50 100 m

N

Scale: 1:4,500

Projection: NAD 1983 UTM Zone 10N

Data Sources:
a) Contours, Kiewit, 2022.
b) Ortho imagery 10 cm, 13 April 2021, Esri Online Service.

Hatfield

Fraser River Barge Facility Permitting

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While sediment deposition and scour rates are not known for this section of the Fraser River, the absence of rooted vegetation within the mudflats suggests the top layer of sediment is scoured away during freshet – preventing the establishment of aquatic vegetation within most of the intertidal zone. Substrates are poorly consolidated and were observed to contain minimal organic material (besides small woody debris), and well-anchored hard surfaces were only observed in the upper intertidal, providing poor habitat for benthic macroinvertebrates and periphyton (Francoeur and Biggs 2006; Schoen et al., 2012; PGL 2022). Benthic refugia (e.g., large woody debris, side-channels, topographical complexity of the river bottom, etc.) that might allow benthic invertebrates to persist throughout freshet, are largely absent from the Project area. This is a further indication of the marginal quality habitat for benthic invertebrates present at the Project area (Vuori et al., 1998; O'Neill and Thorp 2011).

Literature characterizing the benthic invertebrate community within the vicinity of the Project area is limited, however, studies conducted within the sand reach of the Fraser River suggests that the benthic macroinvertebrate community is likely comprised primarily of chironomid larvae and oligochaetes (Taylor et al. 2004). These taxa are often dominant in sandy substrates (Vuori et al. 1998), likely due to their comparatively rapid rate of recolonization after substrate disturbance (Gurtz and Wallace 1984) and feeding habits – which primarily include fine organic matter (Taylor et al. 2004).

The Lower Fraser River is known to be a key migration route for all five species of Pacific salmon and eulachon, as well as providing habitat for resident fish species such as trout and white sturgeon (MOTI 2018). It supports important Indigenous , recreational and commercial fisheries.

The closest tributary to the Project site is Como Creek, which marks the western boundary of the Site and discharges into the Fraser River approximately 60 m west of the western boundary of the Project property. This is a Red Coded Class A or Endangered stream that is fish-bearing (i.e., sustains salmonids) (City of Coquitlam 2022b, CMN 2022).

4.3.3.2 Site use by fish

While a fish sampling program was not within the scope of this work, fish sampling conducted along the shoreline of McMillan Island and Crescent Island (20 km upstream) was conducted as part of the 2018 Fraser River Ambient Monitoring Program for Metro Vancouver (Hatfield provisional data). Like the Project site, McMillan Island is above the Fraser River salt wedge (i.e., entirely freshwater habitat), and supports similar sediments, allowing for a reasonable comparison with the Project area. A summary of fish species captured at and in proximity to the Project area during September 2018 is presented in Table 15.

Table 15 Fish species documented in the vicinity of the Site.

Common Name	Scientific Name	Common Name	Scientific Name
American shad	*Alosa sapidissima*	Northern pikeminnow	*Ptychocheilus oregonensis*
Black crappie	*Pomoxis nigromaculatus*	Peamouth chub	*Mylocheilus caurinus*
Carp sp.	*Cyprinus carpio*	Pumpkinseed	*Lepomis gibbosus*
Chinook salmon	*Oncorhynchus tshawystscha*	Rainbow trout/ steelhead	*Oncorhynchus. mykiss*
Coho salmon	*Oncorhynchus kisutch*	Sculpin	*Cottus sp.*
Cutthroat trout	*Oncorhynchus clarkii*	Smallmouth bass	Micropterus dolomieu

Table 15 (Cont'd.)

Common Name	Scientific Name	Common Name	Scientific Name
Lamprey	*Entosphenus sp.*	Sockeye salmon	*Oncorhynchus nerka*
Largescale sucker	*Catostomus macrocheilus*	Starry flounder	*Platichthys stellatus*
Largemouth bass	*Micropterus salmoides*	Threespine stickleback	*Gasterosteus aculeatus*
Mountain whitefish	*Prosopium williamsoni*		

Source: Hatfield 2019 provisional data

Given stream sediments are dominated by fines and there is a lack of suitable habitat features (e.g., large woody debris, boulders), the Site is likely used only as a migratory pathway for anadromous species such as salmonids and eulachon. However, the nearby Como Creek, which occurs directly outside the western boundary of the Site, may provide some rearing and overwintering habitat.

4.3.4 Species at Risk

The desktop review also included an assessment of aquatic species at risk. Species at risk are identified by both provincial and federal ranking systems. The provincial ranking system applies to species that have been assessed by CDC. The federal ranking system applies to species that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The CDC and COSEWIC publish lists of species at risk. A preliminary list of species was generated from the provincial database by querying the CDC Species & Ecosystem Explorer database to identify listed species that have the potential to occur within or in proximity to the Project area. The Species at Risk Public Registry and DFO aquatic species at risk maps were also reviewed to identify potential aquatic species at risk within the Project area.

Habitat suitability information was used to refine the preliminary list of species for consideration. Scientific literature was further used to evaluate the suitability of habitat features found within the Project area to support critical life history functions for each species on the preliminary species list. Listed aquatic species with the potential to occur within or near the Project area are presented in Table 16.

Table 16 Listed aquatic species with the potential to occur within or near the Project area.

Common Name	Scientific Name	BC List[1]	SARA Status[2]
White sturgeon - Lower Fraser River Population	*Acipenser transmontanus*	Red	-
Eulachon	*Thaleichthys pacificus*	Blue	-

[1] BC List: Red = species that are extirpated, endangered, or threatened; Blue = species that are of special concern.

[2] Schedule 1 of the Species at Risk Act (SARA) is the official list of species at risk in Canada. It includes species that are extirpated, endangered, threatened, and of special concern; however, the general prohibitions do not apply to species of special concern.

White Sturgeon (Lower Fraser River Population)

The white sturgeon – Lower Fraser Population is red-listed by CDC and is listed as Threatened by COSEWIC. They are documented in the Lower Fraser River in and around the Project area. Juvenile white sturgeon generally occur in areas that are 3 to 15 m deep with slow to moderate water velocities (0.1 to 0.5 m/s near

the bottom) and fine substrates (silt and sand) inside channels, pools, backwaters, and mainstem channels (Glova et al. 2009). Adult use of the Fraser River is more variable, depending on the time of year. In general, they are found in deep areas with backwater characteristics and sand and fine gravel substrate (DFO 2014). A recent side-scan sonar survey of the Project area (see PGL Ltd. 2022b, Appendix A2) conducted on January 13, 2022, observed no white sturgeon around the Project area.

Eulachon

Eulachon are mainly a marine species but migrate to freshwater to spawn. Eulachon usually begins to ascend the Fraser River to spawning sites at the end of March and runs until the middle of May (COSEWIC 2011).

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APPENDICES

Appendix A1

Stage 1 and Stage 2 Preliminary Site Assessment and Detailed Site Assessment

1950 Brigantine Drive
Coquitlam, BC

Stage 1 & 2 Preliminary and Detailed Site Investigation

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PGL File: 3014-41.01

March 2022

Executive Summary

Peter Kiewit Sons ULC (Kiewit) retained PGL Environmental Consultants (PGL) to prepare a Stage 1 and Stage 2 Preliminary Site Investigation (PSI) and Detailed Site Investigation (DSI) of 1950 Brigantine Drive, Coquitlam, BC (the Site, Figure 1). The Site is portioned into freehold and leased parcels, occupied by Pacific Custom Log Sorting Ltd. since the 1990s. Kiewit recently purchased the freehold portion of the Site from Pacific Custom Log Sorting Ltd and is assuming the lease for the Vancouver Fraser Port Authority (VFPA) parcels. Kiewit plans to redevelop the Site for construction-related use.

This report is intended to support:

- Preapproval not to delineate upgradient under Protocol 6 (P6) of the Contaminated Sites Regulation (CSR);
- A BC Ministry of Environment and Climate Change Strategy (ENV) Certificate of Compliance for the freehold portion of the Site; and
- A VFPA lease exit approval for leasehold portion of the Site.

This report is prepared to meet the current requirements of the VFPA, specifically those set out in the May 2016 guidance document "Environmental *Baseline and Exit Assessments for VFPA property*". This approach is generally consistent with the DSI requirements of Section 58(1)(a) of the BC Contaminated Sites Regulation.

The objective of the Stage 1 PSI was to identify areas of potential environmental concern (APECs) and their associated potential contaminants of concern (PCOCs), and to recommend further investigation, if necessary.

Between the 1970s and 1990s, portions of the Site, including the water lot and western portion of the Site were utilized for log storage an adjacent sawmill operation further west across Como Creek; some filling was likely completed to level the site for this use. The former Leeder Landfill also operated to the north of the Site during this time infringing on the northern edge of the Site. In the early 1990s the Site was cleared and extended with Fraser River dredge sand fill for use as a log sort. Operations continued to expand over the following decades, creating the current Site configuration by the early 2010s.

Based on our Stage 1 PSI, we have identified five APECs on the freehold and three specific to the on the leased land/water lots:

APEC			PCOC	Soil	Sediment	Ground water	Surface Water	Vapour
#	Description							
1	Freehold/ VFPA Lease	Imported fill including potential wood waste.	• Metals • PAH • Phenols • Chlorophenols	☒	☐	☒	☐	☒
2	Freehold	Former Leeder Landfill along the north edge of the Site.	• Metals • PAH • sulphides	☒	☐	☒	☐	☐
3	Freehold	Fuelling shed area including five ASTs containing diesel, gasoline, mixed gasoline and an oil collection tank.	• Metals • LEPH/HEPH • PAH • MAH • VOCs	☒	☐	☒	☐	☒
4	Freehold	Maintenance Shop for heavy machinery.	• Metals • LEPH/HEPH • PAH • MAH • VOCs	☒	☐	☒	☐	☒
5	Freehold	Eastern boneyard with derelict heavy machinery.	• Metals • LEPH/HEPH • PAH	☒	☐	☒	☐	☐
6	VFPA Lease	Site drainage outfalls in VFPA water lots	• Metals • PAH	☐	☒	☐	☐	☐
7	VFPA Lease	On-water repairs, fueling and maintenance on the moored tug vessels.	• Metals • LEPH/HEPH • PAHs	☐	☒	☐	☐	☐
8	VFPA Lease	General water-lot use for log sort operation including potential dumping and debris	• Metals	☐	☒	☐	☐	☐
9	VFPA Lease	Potentially creosoted pilings	• PAHs	☐	☒	☐	☐	☐

Notes: PCOC = potential contaminants of concern
LEPH/HEPH = light and heavy extractable petroleum hydrocarbons
PAH = polycyclic aromatic hydrocarbons MAH = monocyclic aromatic hydrocarbons
VOC = volatile organic compound

PGL recommended a Stage 2 PSI of the APECs and PCOCs in soil, groundwater, soil-vapour, and sediment on the Site.

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In September, October, and November 2021, PGL investigated the soil, groundwater, soil-vapour, and sediment for the presence or absence of contamination within the identified APECs. 13 investigation locations were drilled and completed as groundwater monitoring wells to characterize site conditions. Four locations were nested with soil-vapour wells. Four additional test-holes were completed to assess soil conditions and 16 sediment samples were collected to assess the waterlot conditions.

Our Stage 2 PSI identified limited, localized soil and groundwater contamination at the Site. Investigations of the freehold portion of the Site has identified arsenic contamination in groundwater, suspected to be the result of flow-through conditions from the former landfill upgradient of the Site. On the leasehold portion of the Site, soil contamination for zinc was identified in one location. These exceedances were broadly delineated directly north (upgradient) and south (downgradient). No contamination was identified in the soil-vapour or sediment.

Following review of preliminary Stage 2 PSI results with VFPA it was determined that CSR standards would be used for further assessment of the lease parcels under the VFPA Exit Assessment process. This included utilizing the CSR Protocol 9 assessment process for identifying background concentrations in groundwater. The CCME guidelines are still presented herein for screening purposes for the locations on VFPA lands (and waterlots), but the CSR standards were used to determine contaminant extent and finalize scope of work for delineation.

PGL completed a Stage 2 DSI where contamination was identified to further assess and delineate contamination. An additional seven monitoring well locations were completed as part of a Detailed Site Investigation in November 2021 and January 2022.

Following DSI investigation the two areas of environmental concern (AECs) have been confirmed with contamination exceeding applicable BC Contaminated Sites Regulation numerical soil standards.

APEC/AEC			Result
#	Description		
1	Onsite – fill of unknown quality on the VFPA lease hold portions of the Site.	Investigation identified widespread fill including mixed wood waste. Significant fill placement between the 1970s and 1990s prior to the commencement of the log sort operation. Some of this fill was suspected to be sourced from a nearby sawmill. Additional fill in the main log sort area and along the foreshore was likely placed/deposited during the log sort operation over the last 20 years.	**RETAINED AS AEC 1** Marginal CCME exceedances were identified on the VFPA parcel in one location for zinc in soil and groundwater, in two locations for naphthalene and phenanthrene and in three locations for pH (outside the CCME guideline range of 6-8) No CSR exceedances were identified for these parameters or other PCOCs related to fill and wood waste on the freehold or VFPA parcels.

APEC/AEC			Result
#	Description		
2	Onsite-former Leeder Landfill along the north edge of the Site.	Former Leeder landfill is directly upgradient for the entire length of the Site. The landfill cease operations in the 1980s. Most of the industrial park in this area is situated on the former landfill upgradient. Warehousing and light industrial buildings were constructed during redevelopment of this area for the industrial park starting in the early 1990s.	**RETAINED AS AEC 2** **Arsenic contamination in groundwater** was identified on the freehold along the north boundary of the Site. This contaminated groundwater is believed to originate from the former Leeder Landfill further upgradient. The contamination has been delineated vertically and further downgradient in the VFPA leasehold. No other PCOCs related to the former landfill were identified at the Site.

Dissolved arsenic in groundwater which has not been delineated further upgradient (offsite). Based on the investigation results, we conclude that the arsenic contamination in groundwater originates from the former Leeder Landfill and not from onsite sources, as such, PGL has requested that the Director grant a preapproval (under ENV Protocol 6) not to delineate the arsenic contamination upgradient of the Site. A P6 preapproval application has been submitted to ENV for consideration.

Additional seasonal sampling is recommended to demonstrate plume stability at the Site. The specific timing and frequency for additional sampling will be determined following ENV response to the P6 preapproval application. In addition, further evaluation of the identified contamination under a Human Health and Ecological Risk assessment is recommended to secure a ENV risk-based Certificate of Compliance.

This report can be used in the future to support an application to ENV an for a Certificate of Compliance along additional supplemental reporting for the work recommended. This report can also be used in support of application to VFPA for a Lease Exit Assessment.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

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List of Acronyms

AEC	-	area of environmental concern
APEC	-	area of potential environmental concern
AST	-	aboveground storage tank
BTEX	-	benzene, toluene, ethylbenzene, and xylenes
CSM	-	conceptual site model
CSR	-	BC Contaminated Sites Regulation
DNAPL	-	dense non-aqueous phase liquid
DSI	-	Detailed Site Investigation
ENV	-	Ministry of Environment and Climate Change Strategy
HEPH	-	heavy extractable petroleum hydrocarbons
LEPH	-	light extractable petroleum hydrocarbons
LNAPL	-	light non-aqueous phase liquid
NAPL	-	non-aqueous phase liquid
PAH	-	polycyclic aromatic hydrocarbons
PCOC	-	potential contaminant(s) of concern
PGL	-	PGL Environmental Consultants
PSI	-	Preliminary Site Investigation
QA/QC	-	quality assurance/quality control
VOC	-	volatile organic compounds
VPH	-	volatile petroleum hydrocarbons
VFPA	-	Vancouver Fraser Port Authority

1.0 INTRODUCTION

Peter Kiewit Sons ULC (Kiewit) retained PGL Environmental Consultants (PGL) to conduct a Stage 1 and 2 Preliminary Site Investigation (PSI) and Detailed Site Investigation (DSI) of 1950 Brigantine Drive, Coquitlam, BC (the Site, Figure 1). This report is intended to support an application for an Approval in Principle or Certificate of Compliance from the BC Ministry of Environment and Climate Change Strategy (ENV) and for consideration for environmental exit assessment required by the Vancouver Fraser Port Authority (VFPA) to transfer tenancy of the leasehold portion of the Site.

This report was prepared, and the investigations were carried out, in accordance with the requirements of the *Environmental Management Act* and CSR. This report will be submitted as part of an application for a regulatory instrument, under the Roster of Approved Professionals provisions of the *Environmental Management Act* and the CSR and may be relied upon by the BC ENV and the Contaminated Sites Approved Professionals Society for this purpose.

This report is also prepared to meet the current requirements of the VFPA, specifically those set out in the May 2016 guidance document "Environmental *Baseline and Exit Assessments for VFPA property*". This approach is generally consistent with the DSI requirements of Section 58(1)(a) of the BC Contaminated Sites Regulation.

2.0 REPORT PARTICIPANTS

The report was prepared by Kim Geeves and Cory Nelson, and was reviewed by Will Gaherty. Stage 1 research and Stage 2 fieldwork were conducted by PGL technicians. Each participant's education, accreditation, role, and experience are summarized below.

Table A: Report Participants

Participant	Education	Accreditation	Role	Experience (years)
Cory Nelson	B.Sc.	P.Ag.	Technical lead and report author	16
Kim Geeves	B.Sc., M.Sc.	A. Ag	Lead field supervisor and report author	3
Will Gaherty	S.B. (2), M.S.	P.Eng	Senior Review	30+

All participants are qualified to complete the scope of their assignments based on the combination of their education, training, and experience.

3.0 BACKGROUND

Between the 1970s and 1990s, the water lot and western portion of the Site, were used for log storage for an adjacent sawmill operation further west across Como Creek. Fill was placed during this period to level the Site so it could be used as a log sort. The former Leeder Landfill also operated to the north of the Site during this time, infringing on the northern edge of the Site. In the early 1990s the Site was cleared and extended with Fraser River dredge sand fill for use as a log sort. Operations continued to expand over the following decades, creating the current site configuration by the early 2010s.

The Site is portioned into freehold and leased parcels, occupied by Pacific Custom Log Sorting Ltd (PCLS) since the 1990s. Kiewit recently purchased the freehold portion of the Site from PCLS and is assuming the lease for the Vancouver Fraser Port Authority (VFPA) parcels.

The objective of this Stage 1 and 2 PSI/DSI is to determine areas of potential environmental concern (APECs) for the Site, determine the presence/absence of contamination for each APEC, and delineate any contamination, if identified. This investigation will be used to ultimately achieve a Certificate of Compliance for the freehold portion of the Site and also support VFPA lease exit approval for leasehold portion of the Site. It is our understanding the Site will remain under Industrial zoning.

4.0 SITE INFORMATION

The Site is a log sorting facility on the north side of the Fraser River, in the Fraser Mills area of Coquitlam, BC (Figure 1). The Site consists of one freehold lot and adjacent leased lands to the north and south, including the waterlot. General information regarding location, land use, and ownership is summarized in Table B. Title documents are provided in Appendix 1.

Table B: Site Identification Information

Civic Address	1950 Brigantine Drive, Coquitlam, BC
Existing Land Use	Industrial
Parcel Identifier	018-882-901
Legal Description	Lot B Except Parcel A (Plan BCP7242), District Lots 18, 19 and 20 Group 1 New Westminster District Plan LMP17876
Latitude*	49° 13' 24.7"
Longitude*	122° 50' 39.8"
Site Area	~ 7 acres

* Source: Google Earth

5.0 APEC AND PCOC IDENTIFICATION METHODS

Based on our experience and generally accepted scientific principles, PGL has developed a process to identify APECs, potential contaminants of concern (PCOCs), and media at risk which has been applied in this investigation. APECs and PCOCs were identified from information gathered from historical records, combined with a risk identification rationale that limits the search area. The rationale was informed by a site specific preliminary conceptual site model (CSM) that incorporates the physical setting and land use of the Site and surrounding area.

APECs on the Site are based on activities identified by our records review, Site inspection, and interviews. APECs can cover the entire Site or just discrete locations.

To identify APECs on adjoining properties, we initially apply a default records review radius of 300m. In this context, we considered prospective offsite APECs only if they:

- Are/were within 300m of the Site;
- Include a risk use; and
- Are not separated from the Site by surface water (surface water can be an effective contaminant migration barrier).

5.1 PCOCs Identification

PCOCs are identified based on the activities that took place at each APEC. Activities are determined by our experience with similar land use and appropriate research. PGL identifies two classes of PCOCs that lead to tiered analysis. Primary and secondary PCOCs are identified. Primary contaminants are those which are:

- Commonly associated with a particular use; and
- Most likely to exceed applicable standards.

Secondary contaminants may be:

- Frequently present but much less likely to exceed applicable standards; and
- Sometimes present, but seldom present if primary contaminants are absent.

Our characterization as primary and secondary is based on the Site use, and the experience and knowledge of our staff with the relative concentrations, which in turn are related to use/production of contaminants at similar sites.

5.2 Media at Risk

Generally, if the APEC is on the Site, we will consider soil, groundwater, and soil-vapour as being at risk. However, where groundwater or vapour transport from offsite sources are identified as a risk, we do not consider the soil matrix to be at risk unless the contaminants can move independently of groundwater. This is a reflection that groundwater does not result in much mass transport.

Because the Site includes the waterlot, sediment is also considered at risk. Generally surface water/porewater were not considered media at risk (in the absence of groundwater contamination that has migrated to the rivers edge) because of the transient nature of surface water along the river front.

6.0 PHYSICAL SETTING

The physical setting of the Site and surrounding area is key to developing a preliminary CSM. The physical setting includes, geology and soil, topography, groundwater, surface water, water use by receptors, climate, and engineered features. The information is presented here and synthesized in our preliminary CSM.

6.1 Topography

The local topography is generally flat, with a slope and bench southward along the shoreline of the Fraser River. The Site is on the north shoreline bench of the Fraser River, and has an average elevation of 5m asl. The Site is south and downgradient from an industrial park and former landfill.

6.2 Surficial Geology

Geological maps[1] indicate surficial soils in the area consist of "*Fraser River Sediment deposits of deltaic and distributary channel fill sediments overlying and cutting estuarine sediments and overlain in part of*

[1] Surficial Geology of New Westminster, Map 1484A, Geological Survey of Canada, 1976 and 1977

the area by overbank sediments. The stratigraphy consists of overbank silty to silt clay loam normally up to 2m thick overlying 15m or more of deltaic and distributary channel fill sandy to silt loam that may contain organic material and fossils". The groundwater at the Site is likely moderately vulnerable to contamination originating at the surface, and contamination in groundwater is likely moderately to highly mobile, given the soil texture and setting.

6.3 Rainfall and Infiltration Rates

A summary of the local climate based on Canadian Climate Normals provided for Como Lake in Coquitlam, approximately 4.2km north of the Site, is presented below. Details are provided in Appendix 2.

The Site is largely paved, so surface infiltration rates are likely low. Precipitation is inferred to be dispersed through overland flow to low points of the Site (i.e., towards the Fraser River).

Table C: Climate Information Summary

Station ID	1101889
Location	Como Lake, Coquitlam, BC
Average Annual Precipitation	1922.8mm
Average Annual Rainfall	1855.5mm
Average Annual Snowfall	67.3 cm
Months with Highest Average Rainfall	November to January
Highest Monthly Average Rainfall	308.5mm – November
Extreme Rainfall Event	175.0mm – November 15, 2021

6.4 Hydrology and Hydrogeology

The site is essentially riverbank, with hydrology and hydrogeology as would be expected in such a setting. Groundwater levels ranged between roughly 2.5 to 5.0m below grade and are tidally influenced. We expect groundwater to flow south towards the Fraser River.

The Site is underlain by the Coquitlam River Floodplain Aquifer. It is predominately an unconfined fluvial or glacio-fluvial sand and gravel aquifer, and because it is found along a major river, it has the potential to be hydraulically influenced by the river. Aquifer details are provided in Appendix 2.

7.0 LAND USE

The Site and surrounding land use help define which receptors may be exposed to contamination. Defining receptors informs which standards are applied during subsequent investigation and remediation. The Site is occupied by a log sorting operation on the north side of the Fraser River. It is our understanding the Site will remain under Industrial zoning.

7.1 Potable Water and Water Wells

The Site receives its water from the municipal system. The City of Coquitlam receives its water from the Coquitlam watershed. The BC Water Resources Atlas indicates that there are no water wells within 300m of the Site (Appendix 3). The Site is serviced with municipal drinking water. The Site is connected to a septic system. The septic system is pumped into the force main.

7.2 Surface Water Bodies

The nearest water body is the Fraser River, which is immediately south of the Site. Como Creek is 50m west of the Site, flowing south into the Fraser River.

7.3 Parks and Recreational Facilities

According to the BC Water Resources Atlas[2], Pacific Reach Linear Park bounds the Site to the west and Fraser River Greenway bounds the Site to the north and east (Appendix 4).

There are no other provincial or national parks, ecological reserves, protected, recreation, conservancy, or wildlife management areas in the study area.

7.4 Environmental Sensitive Areas

An area of Don Roberts Park/Pacific Reach Linear Park adjacent to the western end of the Site is Approved Critical Habitat for Western Painted Turtle Pacific coast population (ID 7351) by Environment and Climate Change Canada under the Species at Risk Act.

8.0 RECORDS REVIEW

The goal of the records review is to establish the history of activity on the Site and surrounding area. This process included a review of historical and background information.

Our historical research indicates the Site was originally developed with a small access road to the Fraser River from an adjacent sawmill. In the early 1990s the Site was cleared, filled, and began to be used as a log sort. Operations continued to expand over the following decades, creating the current Site configuration by the early 2010s.

[2] http://maps.gov.bc.ca/ess/sv/wrbc/

The specific methodology and sources of information PGL used to complete the records review included reviewing:

- Historical records including aerial photographs, city directories, archive information, and fire insurance maps, (where available);
- The BC Site Registry for listed properties with 500m of the Site boundaries;
- Available government agency records for the property (City of Coquitlam and ENV); and
- Available documents for the Site, including other previous environmental investigation or remediation reports.

Table D: Records Review Summary

Information	Source or Contact	Results
Tenure Information	BC LTSA	Section 8.1 and Appendix 1
Previous Environmental Reports	• *Sediment Assessment Report: Pacific Custom Log Sorting Ltd, Coquitlam, British Columbia. File 5697-R-01.01. Balanced Environmental, October 3, 2016.* • *Groundwater Seepage Laboratory Results, South Slope of Intracorp Site. File 1595-01.04. Pottinger Gaherty Environmental Consultants Ltd, June 22, 2001.* • *Groundwater Seepage Issues, Intracorp Site. File 1595-01.04. Pottinger Gaherty Environmental Consultants Ltd, June 22, 2001.* • *Foreshore Reclamation/Habitat Restoration, Pacific Custom Log Sorting Ltd., Coquitlam, BC. File 1595-01.03. Pottinger Gaherty Environmental Consultants Ltd, May 22, 2001.* • *Proposed Stormwater Channel and Outlet Upgrade in the Fraser River in Coquitlam, BC. Environmental Conditions. File 524-1127. Fraser River Estuary Management Program Environmental Review Committee, October 18, 2000.* • *Foreshore Stabilization – Pacific Custom Log Sorting, Coquitlam, BC. File 1595-01.03. Pottinger Gaherty Environmental Consultants Ltd, October 5, 2000.* • *October 5, 2000, Site Meeting at Pacific Custom Log Sorting, Coquitlam, BC. File 1595-01.03. Pottinger Gaherty Environmental Consultants Ltd, October 4, 2000.* • *Water Management Plan for Proposed Sort Yard, Coquitlam, BC. File 1595-01.02. Pottinger Gaherty Environmental Consultants Ltd, August 2000.* • *Natural Boundary Investigation Log Sort Panhandle (West), Coquitlam, BC. File 1595-01.01. Pottinger Gaherty Environmental Consultants Ltd, December 14, 1999.*	Section 8.2 and Appendix 5
Business Directories	InfoAction	Section 8.3 and Appendix 6
Aerial Photographs	UBC Geography and Google Earth	Section 8.4 and Appendix 7
Municipal File Information	City of Coquitlam	Section 8.5 and Appendix 8
Fire Insurance Plans	None available	Section 8.6

Information	Source or Contact	Results
Provincial Contaminated Sites	BC Online Site Registry	Three records within a 500m radius of the Site. Section 8.7 and Appendix 9
Federal Contaminated Sites	Federal Contaminated Sites Inventory	Section 8.8 and Appendix 10

8.1 Title Search

Historical land title searches for the Site were not conducted. There is likely no information in historical titles that would lead us to discover APECs that are not identified by the records review and Site inspection. The Site is owned by Peter Kiewit Sons ULC, Inc. No. BC1102226. A copy of the current title and legal plan is provided in Appendix 1.

8.2 Previous Environmental Reports

Reports previously prepared by PGL and others for the Site and surrounding area are listed and summarized below. Copies of these reports are provided in Appendix 5.

8.2.1 *Natural Boundary Investigation Log Sort Panhandle (West), Coquitlam, BC. File* 1595-01.01. Pottinger Gaherty Environmental Consultants Ltd, December 14, 1999.

PGL completed a preliminary investigation for PCLS into the location of the natural boundary along the western end of the property. This initial investigation involved the review of the historical aerial photography, along with discussions with the BC Surveyor General's office, BC Land Surveyors, and the Fraser River Harbour Commission. PGL concluded that the natural boundary along the western quarter PCLS's property was approximately as shown on the legal survey plan and did not recommend a subsequent investigation.

8.2.2 *Water Management Plan for Proposed Sort Yard, Coquitlam, BC.* File 1595-01.02. Pottinger Gaherty Environmental Consultants Ltd, August 2000.

PGL prepared this report for PCLS in response to a development application to build a log dewatering facility and expand their dry land sort area to the west. PGL assessed the potential environmental issues relating to surface water (stormwater runoff and wash water) originating from the Site and identified best management practices to be implemented to prevent contamination of the neighboring environment. No soil, groundwater, or surface samples were deemed necessary.

8.2.3 *October 5, 2000, Site Meeting at Pacific Custom Log Sorting, Coquitlam, BC.* File 1595-01.03. Pottinger Gaherty Environmental Consultants Ltd, October 4, 2000.

PGL provided background information to Fisheries and Oceans Canada regarding foreshore stabilization at the Site. The City of Coquitlam installed a large stormwater outfall across the Site, and in conjunction with the construction, PCLS proposed to fill and stabilize portions of the foreshore adjacent to the Site. PGL recommended a mitigation/compensation plan for the foreshore stabilization activities. Concepts included:

- Creating a "buffer zone" between the top of bank and parking area;
- Creation of additional foreshore marsh;
- Construction of vegetation pockets within the new riprap wall; AND

- Completion of a plant salvage prior to construction.

Numerous follow-up reports were issued for the Site, which have been chronologically summarized below.

8.2.3.1 *Foreshore Stabilization – Pacific Custom Log Sorting, Coquitlam, BC.* File 1595-01.03. Pottinger Gaherty Environmental Consultants Ltd, October 5, 2000.

PGL provided a revised mitigation/compensation plan for the Fisheries and Oceans Canada, to reduce the area impacted by fill placement by 150m^2.

8.2.3.2 *Proposed Stormwater Channel and Outlet Upgrade in the Fraser River in Coquitlam, BC. Environmental Conditions.* File 524-1127. Fraser River Estuary Management Program Environmental Review Committee, October 18, 2000.

This letter report was prepared for the Fraser Port Authority in response to an application made to the Fraser River Estuary Management Program Environmental Review Committee for an environmental review of the proposed stormwater channel and outlet upgrade (as per above). Based on the revised mitigation/compensation provided by PGL, the Environmental Review Committee concluded that the proposed works to upgrade the stormwater outfall was not expected to result in adverse impacts to fish, wildlife, or their habitat(s). The Environmental Review Committee outlined 14 conditions to be met during construction, expiring on October 7, 2001.

8.2.3.3 *Foreshore Reclamation/Habitat Restoration, Pacific Custom Log Sorting Ltd., Coquitlam, BC.* File 1595-01.03. Pottinger Gaherty Environmental Consultants Ltd, May 22, 2001.

PGL completed this letter report for Intracorp Developments Ltd. (neighboring northern property owner) to confirm completion of the foreshore reclamation and erosion protection work on the Site. PGL was retained by PCLS to facilitate the environmental approval process for the restoration of a short section of foreshore on the Site with Fisheries and Oceans Canada and Fraser River Estuary Management Program. PGL reviewed the reclamation work and was satisfied that the foreshore reclamation and erosion control work were built as per standard practice.

8.2.4 *Groundwater Seepage Issues, Intracorp Site.* File 1595-01.04. Pottinger Gaherty Environmental Consultants Ltd, June 22, 2001.

This report presented recommendations to PCSL based on the groundwater laboratory results collected by PGL in June 2001 and to identify drainage issues resulting from discharge of groundwater from the adjacent northern site (a former landfill), owned by Intracorp Developments Ltd. PGL concluded groundwater seepage occurred along the slope between the sites and entered PCLS's stormwater runoff collection and treatment system. PGL sampled one of the prominent seeps, which identified low strength (aged) leachate. PGL identified two significant issues with respect to the seepage: (1) the current stormwater system was not designed to capture and treat leachate runoff, and (2) high groundwater levels may cause excessive runoff and is important in areas where there were no ditches that provide lateral drainage. PGL recommended that Intracorp install a groundwater interception trench to help alleviate the issues outlined previously.

8.2.4.1 Groundwater Seepage Laboratory Results, South Slope of Intracorp Site. File 1595-01.04. Pottinger Gaherty Environmental Consultants Ltd, June 22, 2001.

This report presented the laboratory results of seep sampling conducted by PGL. The groundwater results suggested an organically enriched low strength leachate was present, which was consistent with the quality of the surrounding soil. Further recommendations were made by PGL in the previously summarized report (Section 8.2.4.).

8.2.5 *Sediment Assessment Report: Pacific Custom Log Sorting Ltd, Coquitlam, British Columbia.* File 5697-R-01.01. Balanced Environmental, October 3, 2016.

This report was completed for work within the water lot of the Site. The investigation was completed to obtain a renewable Disposal at Sea permit to allow maintenance dredging of up to 4,000m^3 of material from PCSL water lot, annually, over a five-year period.

Six composite sediment samples were collected using an excavator from a spud barge. Sediment material primarily consisted of sand and silt. The samples were analyzed for metals (cadmium, mercury, arsenic, chromium, copper, lead, zinc), total polycyclic aromatic hydrocarbons (PAHs), total polychlorinated biphenyls, total organic carbon, and particle size. Copper levels in five sediment samples were non-compliant with Disposal at Sea Minimal Sample Analytical Requirements. All other analytical results were within the guidelines. Balanced Environmental concluded that a portion of the material to be dredged was suitable for Disposal at Sea and the rest was to be determined through further consultation with Environment Canada.

Based on the historical report review, the former landfill (retained as APEC 2), Site drainage outfalls into the VFPA water lot (retained APEC 6), and general water lot use for log sort operations (retained as APEC 8) are all retained as APECs from the report review.

8.3 Business Directory Search

To examine the history of the Site and surrounding area, business directories were studied at five-year intervals from 2000 back to 1990 (directories for this area were not published prior to 1990 or after 2001). Directories were obtained from InfoAction, an information and research centre at the Vancouver Public Library (Appendix 6).

8.3.1 The Site

The Site was never listed in business directories.

8.3.2 Neighbouring Properties

Business directories from 2001, 1995 and 1990 were reviewed for Brigantine Drive, Hartley Avenue and Schooner Street. The area was first listed in the early 1990s as the landfill area was redeveloped with the current commercial and warehousing/distribution properties. Business directories indicate that some of these properties have been occupied by service commercial and light industrial tenants including general contractors, metal fabricators, and vehicle repair businesses. It is possible that some of these activities have localized contamination associated with them. Aerial photographs indicate that these activities have always occurred indoors and on paved surfaces. Given the type of activities and the distance from the Site, we do not consider these properties a risk.

No new risks were identified from the business directories review.

8.4 Aerial Photographs

We reviewed a series of historical aerial photographs obtained from the University of British Columbia geography department library. Clearing and filling of the Site, including the foreshore took place in stages, between 1974 through 1989. The north adjacent Leeder landfill was actively filling from 1954 through 1974. In the early 1990s the Leeder landfill was preloaded prior to development with warehouses. Site filling (retained as APEC 1), and the Leeder Landfill (APEC 2) are both carried forward as APECs, and discussed further in Section 9.2

The detailed aerial photograph review is available in Appendix 7.

8.5 Municipal Search

PGL contacted the City of Coquitlam Planning and Development department to do a search of their databases (Appendix 8). The only records available for the Site indicate that complaints were received related to garbage dumping and temporary shelters for unhoused individuals.

8.6 Fire Insurance Plans

Fire insurance plans were never published for this area of Coquitlam.

8.7 Provincial Contaminated Sites – BC ENV Site Registry

PGL searched the ENV Site Registry through BC Online (Appendix 9) on January 9, 2022. Three properties were on file within a 0.5km radius of the Site. Two of these properties are more than 400m from the Site and are not a concern.

The final entry is for ENV Site ID 93, which includes the addresses 68, 88, 95, 98 Brigantine Drive and 1450, 1478, 1500, 1501, 1550, 1578 Hartley Avenue. This property is on the registry for the former landfilling operation that extended onto the Site. These former onsite landfilling activities have previously been identified as a risk and are retained as APEC 2.

No new APECs were identified from the ENV Site Registry review.

8.8 Federal Contaminated Sites Inventory

PGL searched the Federal Contaminated Sites Inventory. No entries were identified within our search area that are a risk to the Site (Appendix 10).

9.0 SITE RECONNAISSANCE

PGL staff visited the Site on multiple occasions between April 2021 and January 2022 to assess current Site conditions and to identify potential environmental concerns that may be present at the Site and in the surrounding area. Photographs taken during the Site inspections are provided in Appendix 11.

9.1 Site Reconnaissance

The Site is a log sorting facility on the north side of the Fraser River. The Site is comprised of one legal lot and two adjacent leased lands to the north (City of Coquitlam) and the south (Port Authority) of the Site.

Logs are sorted on the central and western portions of the Site and separated into the 'West Sort' and 'East Sort'. The log sorting area has associated 'strapper shacks' (lunchrooms) and small outbuildings. The sorting areas are paved: the East Sort was paved in the early 1990s when PCLS first occupied the Site, and the West Sort was paved in the early 2000s. We estimate that less than 10% of the terrestrial area of the Port Authority site is paved.

Centrally near the Site entrance is a gravel parking lot, three office trailers, and a maintenance shop. The maintenance shop is a Quonset hut on top of a concrete slab, used to repair and maintain heavy equipment. The eastern portion of the Site is gravelled or undeveloped and occupied by the fuel shed, dock access, and a boneyard used to store derelict heavy equipment.

The water lot is used for log sorting operations, as well as minor on-water repairs, fueling, and maintenance on moored tug vessels.

The fuel shed is an APEC (retained as APEC 3) and is discussed further in Section 9.6. The maintenance shop (retained as APEC 4) and boneyard (retained as APEC 5) are carried forward as APECs and discussed further in subsequent sections below. The water lot is also carried forward as an APEC due to fueling, repairs (retained as APEC 7), and the potential for dumping of debris from general use as a log sorting operation (entire water lot retained as APEC 8).

9.2 Fill

The northern portion of the Site was historically part of the Leeder landfill which was actively filling from the 1950's through the 1970's. The historical landfill is an area-wide municipal issue. On Site, the west, east and foreshore areas were filled throughout the 1970s and 1980s. Wide-area historical landfill material is a risk to site soil, groundwater, and soil-vapour. Soil quality is a concern if removed for offsite disposal during future development. Both the Leeder Landfill (APEC 2 along the norther edge of the Site) and onsite filling (APEC 1 entire terrestrial portion of the Site) have been retained as APECs.

9.3 Heavy Machinery/Equipment

A crane was installed on the West Sort in 2001 to take log bundles from the Fraser River and place them onsite. The crane moves via hydraulics and has its own oil collection system in the upstairs of the crane, designed to collect residual drops during maintenance. The residual oil gets drained into barrels and removed from Site via GFL. The crane is inspected daily. A green outbuilding resides east of the crane, and formerly housed a generator. The generator is no longer present, and the area is occupied by a BC Hydro transformer.

An electric debarker resides west of the machine shop and removes bark from logs. The debarker is inspected daily. Bark from the debarker is removed from Site by Augustine Soil & Mulch Ltd.

Housekeeping in the crane and debarker areas was generally good, and without notable visual staining or impacts surrounding, neither are considered a risk to the Site.

A boneyard, used to store heavy equipment no longer in use, is located at the east end of the Site. Based on materials stored (equipment with residual fuels and liquids), and general housekeeping in the area, the boneyard is retained as APEC 5.

9.4 In-ground Hoists

There are no in-ground hoists associated with the machine shop.

9.5 Storage Tanks

PGL inspected the Site for evidence of underground or aboveground storage tanks (USTs/ASTs).

9.5.1 USTs

Given the historical uses of the Site and the high-water table in the area, USTs are not expected. No evidence of USTs (standpipes, vents) was noted during the Site inspection.

9.5.2 ASTs

Five ASTs were observed during the Site inspection. The ASTs are located within the fuel shed on the eastern portion of the Site. All ASTs are double walled, sit on a concrete slab, and have secondary containment. The diesel ASTs and the oil collection tank AST are inside the fuel shed, and the gas and mixed gas ASTs are on the west side of the fuel shed undercover. Volume and content information for each AST is below:

Table E: AST Inventory

AST Product	AST Volume (L)	Location	Use
Diesel	9,000	Inside the western half of Fuel Shed	Wheel loader and dry land equipment
Diesel	35,000	Inside the eastern half of Fuel Shed	Dock fuel
Gas	~1,000	Outside under cover, west of Fuel Shed	Light duty machinery
Mixed Gas	230	Outside under cover, west of Fuel Shed	Light duty machinery
Oil Collection Tank	~9,000	Inside the western half of Fuel Shed	Oil-water separator

The oil collection tank is connected to an oil-water separator. A sump beneath the 9,000L diesel tank is pumped through the oil/water separator into the oil collection tank.

We inspected the fuel shed ASTs and did not observe any significant impacts (spills or stressed vegetation) around them. We have retained this area as APEC 3 based on the length of time they have been present onsite, and volumes of fuels and waste oil stored.

A former 1,300L AST was also located adjacent the crane, further west in the log sort portion of the Site. The AST was double walled, on a concrete pad, and present for about two years. No surficial staining or stressed vegetation was observed in the area; this tank has not been retained as an APEC.

9.6 Storage Containers and Hazardous Materials

Hazardous materials are stored in the maintenance shop and fuel shed and include standard hazardous materials for maintaining heavy machinery. A description of onsite hazardous materials is below:

Table F: Hazardous Material Description

Hazardous Material	Volume	Location
Hydraulic Oil	45-gallon drums, 20L pails and bulk tanks	Machine shop and fuel shed
Lubricant	20L pails and consumer size quantities	Machine shop and fuel shed
Motor Oil	946mL containers	Machine shop and fuel shed
Coolant/antifreeze	45-gallon drums and 20L pails	Fuel shed

Some empty drums were observed at the Site access; PGL understands these drums are slated for removal.

The maintenance shop and fuel shed have already been identified as APECs.

9.7 Drains and Sumps

There is one catch basin and one sump at the Site. A concrete catch basin is in the middle of the machine shop. It gets pumped into 45-gallon drums and removed from Site via GFL Environmental Inc. The sump is beneath the 9,000L drum in the fuel shed. An outside drain beneath the covered area of the fuel shed drains to the sump. The sump is connected to a float pump that pumps the oily water into the oil-water separator, then into the oil collection tank.

The log sort was designed with a containment and drainage system through the former Fraser River Estuary Management Program. Runoff from the West Sort and East Sort are directed into two separate sediment ponds. Runoff from the sediment ponds enter the foreshore before entering the Fraser River. Absorbent booms are placed where runoff exits the sediment ponds to capture any surficial oil/fuel drops from the heavy machinery. The Site drainage outfalls are carried forwards as an APEC (retained as APEC 6).

9.8 Waste Steams

All waste streams are removed from Site via contractors. Office waste produced onsite is removed by Maple Leaf Disposal; waste oil and used oil filters are removed by GFL Environmental Inc. on a monthly basis; bark and wood chips from debarking logs is removed by Augustine Soil & Mulch Ltd. daily (four to six loads per day); and strapping from log bundles are removed by Trojan Alloys Ltd. on a monthly basis.

9.9 Stains, Odours, and Stressed Vegetation

Stains were observed on the concrete slab within the maintenance shop and fuel shed. The observed stains are not uncommon for repair and hazardous waste storage activities. Minor surface staining was observed at the western extent of the boneyard. All three areas have already been identified as APECs.

No other stains, odours, or stressed vegetation (a potential indicator of contamination) were observed.

9.10 Potable Water and Sewage

The Site is supplied with municipal drinking water. There is no sewer service to the Site; the Site is connected to a septic system. The septic system is pumped into the force main.

9.11 Neighbouring Area Reconnaissance

The area to the north of the Site was historically the Leeder Landfill. Most of the Pacific Reach industrial park in this area is situated on the former landfill. Warehousing and light industrial buildings were constructed during redevelopment of this area for the industrial park starting in the early 1990s.

The surrounding area is Industrial. Surrounding property uses include:

- North – industrial warehouses, then Brigantine Drive;
- East – Fraser River Greenway Park, then industrial warehouses;
- South – Fraser River; and
- West – Don Roberts Park, then industrial warehouses.

We did not observe any current operating service stations, dry cleaners, or other operations that might pose a risk to the Site through migration of contamination.

10.0 STAGE 1 CONCEPTUAL SITE MODEL

A CSM describes the potential sources of contamination on the site, the potential receptors in the receiving environment, and the pathways along which contaminants might flow from the source to the receptors. Such a model serves as a scientific basis for structuring a site investigation, and judging the significance of contamination at a site, if any. This section develops a preliminary CSM for the Site based on the following inputs:

- Physical characteristic of the Site, including climate, topography, infiltration, soil stratigraphy and geology, and hydrogeology;
- Potential sources of contamination on the Site and surrounding area, the characteristics of the contaminants and their relationships to the activities that have taken place; and
- Potential receptors in the receiving environment and the pathways along which contaminants might flow from the source to the receptors.

10.1 Physical Characteristics

Site physical characteristics are more completely presented in Section 6.0. The local topography is generally flat, with a slope and bench southward along the shoreline of the Fraser River. The Site is on the shoreline bench, downslope from the industrial park (former landfill area). The Fraser River flows east to west. The Site is bound by Pacific Reach Linear Park and Como Creek. Subsurface soils consist of Fraser River Sediments. Groundwater flow direction is inferred to be towards the south. Groundwater depth is between 2.5m and 5.0m below grade, and tidally influenced.

10.2 Contamination Sources and PCOCs

Potential contamination sources are listed in Table G. Based on the APECs identified in Table E; potential contaminant sources fall into three categories.

Table G: Sources of Contamination and PCOCs

Site Use	PCOCs and Contamination Source
Heavy machinery storage, repair and fuel storage	Sites that operate, maintain, store and fuel heavy machinery handle various fuels, lubricants and part-cleaning solvents. Site documentation notes that housekeeping is generally fair, and products were appropriately stored in good condition ASTs, drums, and tanks. Contamination can result from product spills or from leaking storage vessels. Contamination due to spills is often found near fluid drainage facilities such as strip drains, piping and interceptors. PCOCs associated with heavy equipment maintenance and fueling are: • LEPH/HEPH associated with gasoline, diesel, and oil; • Benzene, toluene, ethylbenzene and xylene (BTEX) associated with gasoline and diesel; • Metals associated with new and used oil; • PAH associated with diesel, and oil; • Volatile organic compounds (VOC) associated with parts cleaning solvents and fuel additives; • Volatile petroleum hydrocarbons (VPH) associated with gasoline and diesel; and • Metals associated with vehicle body crushing and scrap metal storage. The impacts of contamination from theses uses and activities are likely to be limited and near the surface and on the water lot
Log booming and boat operations	Risks to sediment are substantially mitigated for any highly soluble PCOCs by the water column. PCOCs are: • EPH associated with hydrocarbon fuels and lubricants • Metals associated with paint and industrial operations • PAHs associated with pilings and boat operations
Fill soil (onsite and offsite Landfill)	Available information suggests the Leeder Landfill accepted mostly soil and demolition and land clearing debris. Fill soil from an unknown location could contain anything; however, the most common contaminants are: • Metals; and • LEPH/HEPH, PAH (if field screening indicates odours).
Drainage Outfall	PCOCs associated with Site drainage include metals and PAHs.

10.3 Pathways and Receptors

Potential receptors are only at risk if they are exposed to contaminated media. Based on our understanding of the potential contaminant sources and PCOCs, we expect the following:

- Most PCOCs are likely to be released at or near the surface;
- Soil below the point of large release is likely to be contaminated;
- Soluble and liquid PCOCs can migrate downwards and contaminate groundwater. Contaminated groundwater can move away from the point of release, generally following the flow gradient;
- Soil is unlikely to be contaminated by dissolved substances migrating in groundwater but could become contaminated by migrating free-phase hydrocarbons; and
- Soil vapour can be contaminated by vaporization of volatile contaminants (BTEX/VPH, VOC, naphthalene) from contaminated soil and groundwater. Vapour generally disperses towards the ground surface but can travel laterally. Vapour migrations can be controlled by variations in surface cover, and preferential pathways.

Nearby freshwater aquatic systems (Fraser River, Como Creek) can potentially receive groundwater from the Site. The Fraser River located immediately south of the Site is considered freshwater aquatic habitat.

There are no drinking water receptors currently at or near the Site; however, the ENV considers all groundwater in the province, regardless of location or land use, to be a potential drinking water source now and in the future. The CSR Drinking Water (DW) standards are applied by default unless Site-specific testing demonstrates that the aquifer or groundwater resource is incapable of producing water at a specified yield, or that the natural quality of the groundwater is unsuitable for drinking water purposes.

Based on our understanding of the likely fate of PCOCs in the environment, soil, groundwater, vapour, and sediment are at risk of contamination. Without further work to rule out exposure, or drinking water suitability, the following are considered receptors:

Table H: Potential Receptors

Receptors	Pathways					
	Soil Contact	Soil Ingestion	Groundwater Contact	Groundwater Ingestion	Vapour Inhalation	Not Applicable
Human	☒	☒	☒	☒	☒	☐
Terrestrial Wildlife	☒	☒	☒	☒	☒	☐
Terrestrial Invertebrates and plants	☒	☒	☒	☒	☒	☐
Aquatic Life (freshwater)	☒	☒	☒	☒	☐	☐
Aquatic Life (marine)	☐	☐	☐	☐	☐	☐
Drinking Water	☒	☒	☒	☒	☐	☐

Marine life standards were discounted on the basis of information from VFPA which indicate that the Site is upriver of the known boundary of the salt wedge, whose maximum reach has been recorded as west end of the Sapperton Channel even at low discharge.

Based on the foregoing, our CSM is as follows:

We consider surface and near-surface soils and shallow groundwater (less than 2m depth) to be at risk from Site and surrounding area uses. We consider vertical and lateral migration to have low to moderate potential unless a preferred pathway is present. There are no significant sources of Light Non-aqueous phase liquids (NAPL) or Dense NAPL.

The Stage 2 PSI will incorporate the following general design guidelines:

- Drilling to strategically assess onsite and offsite APECs;
- Soil sampling in onsite soils to assess onsite PCOCs;
- Sediment sampling from within the waterlot to assess onsite and offsite APECS;
- Groundwater wells installed in boreholes and screened at the first encountered water table;
- Groundwater sampling at the water table for onsite PCOCs; and
- Soil-vapour wells installed above the water table and sampled to assess onsite and offsite volatile PCOCs.

11.0 STAGE 1 CONCLUSION

Based on our Stage 1 PSI, preliminary CSM and risk identification rationale we have identified nine APECs for the Site (Table I below and Figure 3).

Table I: APECs and PCOCs

APEC			PCOC	Soil	Sediment	Groundwater	Surface	Vapour
#	Description							
1	Freehold/VFPA Lease	Imported fill including potential wood waste.	• Metals • PAH • Phenols • Chlorophenols	☒	☐	☒	☐	☒
2	Freehold	Former Leeder Landfill along the north edge of the Site.	• Metals • PAH • sulphides	☒	☐	☒	☐	☐
3	Freehold	Fuelling shed area including five ASTs containing diesel, gasoline, mixed gasoline and an oil collection tank.	• Metals • LEPH/HEPH • PAH • MAH • VOCs	☒	☐	☒	☐	☒
4	Freehold	Maintenance Shop for heavy machinery.	• Metals • LEPH/HEPH • PAH • MAH • VOCs	☒	☐	☒	☐	☒

APEC			PCOC	Soil	Sediment	Groundwater	Surface	Vapour
#	Description							
5	Freehold	Eastern boneyard with derelict heavy machinery.	• Metals • LEPH/HEPH • PAH	☒	☐	☒	☐	☐
6	VFPA Lease	Site drainage outfalls in VFPA water lots	• Metals • PAH	☐	☒	☐	☐	☐
7	VFPA Lease	On-water repairs, fueling and maintenance on the moored tug vessels.	• Metals • LEPH/HEPH • PAHs	☐	☒	☐	☐	☐
8	VFPA Lease	General water-lot use for log sort operation including potential dumping and debris	• Metals	☐	☒	☐	☐	☐
9	VFPA Lease	Potentially creosoted pilings	• PAHs	☐	☒	☐	☐	☐

Notes: PCOC = potential contaminants of concern
LEPH/HEPH = light and heavy extractable petroleum hydrocarbons
PAH = polycyclic aromatic hydrocarbons MAH = monocyclic aromatic hydrocarbons
VOC = volatile organic compound

PGL recommended a Stage 2 PSI of the APECs and PCOCs in soil, groundwater, soil-vapour, and sediment on the Site.

12.0 REGULATORY

The freehold portion of the Site falls under provincial jurisdiction, therefore BC CSR standards apply for this portion of the Site.

The portion of the Site leased from VFPA falls under federal jurisdiction, therefore results were initially compared to both federal (Canadian Council of Ministers of the Environment [CCME]) and provincial (BC CSR) environmental standards/guidelines. Following preliminary review of Stage 2 PSI results with VFPA in November 2021, it was determined that CSR standards were acceptable for further assessment of the lease parcels under the VFPA Exit Assessment process. The federal guidelines are still presented herein for screening purposes for the locations on VFPA lands (and water lots), but the CSR standards were used to determine final contaminant conditions for the Site.

The applicable guidelines/standards for the Site are as follows:

12.1 Soil

For soils, guidelines/standards were developed for four individual land uses. The criteria include numerical values for agricultural, residential/parkland, commercial, and industrial sites. The Site is considered an industrial land use, so Industrial Land use standards have been applied to soil.

The CCME Canadian Soil Quality Guidelines (used for initial screening) provides standards based on land use as well as soil texture (coarse or fine). Soil stratigraphy and laboratory analysis verified coarse texture (> 75um), so only coarse-grained guidelines were applied for the screening.

12.2 Groundwater

Groundwater standards are determined by the potential of groundwater beneath the Site to impact surface water bodies containing aquatic life. Standards protecting human health are applied if the groundwater is a potential drinking water source.

The Federal Interim Groundwater Quality Guidelines (used for screening) has standards to protect soil and organisms, and also to prevent exposure though inhalation. The Federal Interim Water Quality Guidelines are based on the texture of the soil (fine or coarse).

12.2.1 Aquatic Life Water Standards

Aquatic Life Water Use Standards apply to all groundwater that is or can migrate to within 500m of a surface water body, or if a preferred pathway leads to within 500m of a surface water body. Different standards are applied to marine and freshwater bodies. The Site is adjacent to the Fraser River along a section that is tidally influenced but upstream of the maximum recorded reach of salt water therefore both only Freshwater Aquatic Life Standards are applied.

12.2.2 Drinking Water Standards

Drinking Water Standards are applied by default unless site-specific testing demonstrates that the groundwater resource is incapable of producing water at a specified yield, or that the natural quality of the groundwater is unsuitable for drinking water purposes. Drinking Water Standards are assumed to apply.

12.2.3 Irrigation and Livestock Watering Standards

Irrigation and livestock watering use applies if watering well intakes are within 500m of the outer extent of a groundwater contamination source. No land use associated with irrigation and livestock watering is near the Site. Irrigation and livestock watering standards do not apply.

12.3 Soil-vapour Pathways and Standards

The CSR requires assessment of soil-vapour concentrations at sites with volatile PCOCs. Numerical standards for soil vapour are based on land use, and are found in Schedule 3.3 of the CSR. To assess the operability of exposure pathways, vapour data is normally compared to standards after the application of attenuation factors. Attenuation factors account for exposure differences between the vapour source area and the expected breathing space. Attenuation factors are selected based on indoor or outdoor exposure, and the barriers/distance between the vapour source and exposure, such as the depth of the soil or concrete slabs.

Comparison to standards after applying sub-slab attenuation factors is considered a conservative approach onsite and offsite:

- The current and future land use at the Site is industrial; therefore, the industrial standards are applied. Sub-slab attenuation factors apply near all buildings (within 30m);
- The exact future development configuration is unknown. We assume no future buildings will have basements or parkades; and
- Offsite areas are occupied by older slab-on-grade buildings. Newer developments with potential underground parking areas were constructed after 2012 and would meet Protocol 22 requirements for applying sub-slab attenuation factors.

12.4 Sediment

Sediment pathways are considered slightly differently under the CSR and CCME. The CCME Probable Effects Levels (PELs) standards are comparable to the CSR Typical use standard in terms of expected application to working harbours:

- Under the CSR, sediment quality standards protect freshwater, marine, and/or estuarine aquatic life in sensitive and typical aquatic habitats. Sensitive or Typical sediment standards may apply. According to the technical appendix for *Criteria for Managing Contaminated Sediment in British Columbia*, typical sediment criteria are applied at marinas, docks, and wharves; and
- PELs are used in the Canadian Sediment Quality Guidelines to evaluate the potential for adverse biological effects. The Interim Sediment Quality Guidelines are more stringent guidelines, and represent concentrations at which biological effects are rarely observed, whereas the PEL represents a level at which biological effects are commonly expected. PGL customarily considers the CCME PELs for working harbours in consideration of the *Federal Contaminated Sites Action Plan Guidance for Assessing and Managing Aquatic Contaminated Sites in Working Harbours* Version 5.1 (July 2017).

Sediment results were compared to:

- CSR Schedule 3.4: Sediment Criteria for typical marine sites; and
- CCME PELs for marine sites (for screening purposes).

12.5 Summary Applicable Guidelines, Criteria, and Standards

Based on our review of Site information and in accordance with the above provincial (and federal) regulations, the following standards and guidelines are applicable at the Site.

Table J: Summary of Applicable Standards/Guidelines

Media (Pathway)	Federal Guidelines (for screening purposes)	Applicable Provincial Guidelines
Soil • Industrial land use • Freshwater aquatic life use • Toxicity to invertebrates and plants • Human health	• CCME Canadian Soil Quality Guidelines • CCME Canada-Wide Standards for Petroleum Hydrocarbons in Soil	CSR soil standards (Schedule 3.1)
Groundwater • Commercial/Industrial land use • Protection of freshwater aquatic life	• Guidance document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites	CSR groundwater standards (Schedule 3.2)
Soil-vapour • Industrial land use • Outdoor attenuation applied	• N/A	CSR soil-vapour standards (Schedule 3.3)
Sediment • Protection of freshwater life in typical aquatic habitats	• CCME Canadian Sediment Quality Guidelines Probable Effects Levels (PEL)	CSR sediment standards (Schedule 3.4)

13.0 STAGE 2 PRELIMINARY AND DETAILED SITE INVESTIGATION

The objective of the Stage 2 PSI was to assess each APEC identified in the Stage 1 PSI for applicable PCOCs. The objective of the DSI was to delineate identified contamination.

To assess the APECs and PCOCs, PGL tested soil, groundwater, soil-vapour, and sediment (Figure 3). PGL identified and delineated soil and groundwater contamination for PCOCs related to APECs on the Site.

13.1 Field Methods

The work in the field included drilling boreholes and installing groundwater and soil vapour wells. Sediment samples were also collected using a Van-Veen dredge sampler. Soil, groundwater, soil-vapour, and sediment samples were collected and analyzed using methods appropriate to the investigation and consistent with industry and regulatory standards.

Our PSI and DSI design is based on:

- The APECs and PCOCs (Section 11.0);
- The preliminary CSM (Section 10.0);
- *Technical Guidance Document #1* (Site Characterization and Confirmation Testing);
- *Technical Guidance Document #4* (Vapour Investigation and Remediation);
- *Technical Guidance Document #8* (Groundwater Investigation and Characterization);
- *Technical Guidance Document #15 (Concentration Limits for the Protection of Aquatic Receiving Environments);*
- VFPA guidance document "Environmental *Baseline and Exit Assessments for VFPA property*"; and
- Property size and accessibility.

Investigation locations were placed to assess specific APECs. Investigation locations associated with each APEC are summarized below and depicted on Figure 3. Individual investigation locations can investigate multiple APECs. In general, investigation locations were placed within or immediately downgradient of APECs.

Table K: Stage 2 PSI Summary

APEC		Investigation Locations
1	Imported fill including potential wood waste.	BH01M to BH11M, BH14M, BH15M and TH01 to TH04, SV1
2	Former Leeder Landfill along the north edge of the Site.	BH01M to BH10M, BH12M, BH13M
3	Fuelling shed area including five ASTs containing diesel, gasoline, mixed gasoline and an oil collection tank.	BH09M, SV3
4	Maintenance Shop for heavy machinery.	BH07M, BH15M SV2
5	Eastern boneyard with derelict heavy machinery.	BH10M, TH03
6	Site drainage outfalls in VFPA water lots	SE-04, SE14, SE-16
7	On-water repairs, fueling and maintenance on the moored tug vessels.	SE-09, SE-10, SE-11

APEC		Investigation Locations
8	General water-lot use for log sort operation including potential dumping and debris	SE-01 to SE-16

PGL's standard methodologies were appropriate for the investigation and are summarized, with additional description of PGL's general field sampling protocols, in Appendix 12. PGL did not deviate from standard protocols.

PGL followed standard procedures for all field activities to maintain consistency in data collected and to minimize potential for cross-contamination during sampling. The procedures were adopted based on generally accepted environmental engineering practice and ENV guidelines for site characterization.

13.2 Drilling

Drilling was conducted using a truck-mounted sonic rig. Prior to drilling events, utility drawings were reviewed to avoid damaging underground utilities. BH01 through BH15M and BH19M were installed and finished at grade with a flush mount protective cover. Wells BH16M, BH17M, BH18M, and BH20M were installed and finished as stick-ups protected with monument casings. Well installation details are presented in the borehole logs (Appendix 13).

Drilling took place during multiple events:

- September 2021 (BH01M to BH10M, SV1 to SV3).
- November 2021 (BH11M to BH15M, TH01-TH04).
- January 14, 2022 (BH16M to BH20M).

All locations were installed with groundwater wells. Soil vapour well SV1 was nested with BH04M, SV2 with BH07M, SV3 with BH09M, and SV4 with SV15. Locations TH-01 through TH-04 were collected by hand auger on November 4, 2021. Borehole logs are provided in Appendix 13.

13.3 Soil Sampling

Soil samples were collected at 1.0m depth intervals (or less in some cases) below the ground surface. Samples were also collected from each stratigraphic unit and from material showing indicators of contamination, if any. Soil samples were split into two soil jars (to compensate for broken jars, lost labels, etc.), two methanol pre-charged vials where possible, and a sealed plastic bag. The bagged split of each sample was field screened for headspace vapours, visual observations, and composition. An RKI Eagle combustible vapour monitor was used to screen for volatile hydrocarbon soil contaminants. The results of observations from each borehole were logged (Appendix 13).

Soil samples were collected in conformity with ENV *Technical Guidance Document #1*. All soil samples were discrete grab samples. Samples were collected directly with a clean-gloved hand. Gloves were changed between consecutive sampling locations. Samples were labelled with unique sequential names (e.g., BH01M-01 to BH01M-04).

13.4 Groundwater-Monitoring Well Construction

Groundwater-monitoring wells were constructed in conformity with ENV *Technical Guidance Document #8.* Well construction details are shown on the borehole logs in Appendix 13.

13.5 Groundwater Sampling

Prior to sampling, wells were developed to ensure that the groundwater collected was representative of *in situ* conditions. The wells were developed and sampled using standard PGL protocols. Groundwater wells were sampled during multiple events:

- September 22, 2021 (BH07M to BH10M)
- September 27, 2021 (BH02M to BH06M)
- September 28, 2021 (BH01M)
- November 8, 2021 (BH12M, BH14M and BH15M).
- November 10, 2021 (BH11M and BH13M).
- November 17, 2021 (BH05M, BH12M to BH14M).
- January 18, 2022 (BH05M, BH12M, BH13M, BH16M to BH20M).

Water well sampling records are provided in Appendix 15.

13.6 Soil-vapour Locations and Well Installation

Soil-vapour monitoring wells were constructed in conformity with ENV *Technical Guidance Document #4 – Vapour Investigation and Remediation (July 2009)* and Contaminated Sites Approved Professionals Society *Soil Vapour Advice and Practice Guidelines Development – Stage 1 (October 2009)*. Vapour wells consisted of a 10mm-diameter, stainless-steel, mesh-screen probe (15cm in length) connected to nylon pressure tubing from screen to surface.

Vapour well construction details are shown on the borehole logs in Appendix 13.

13.7 Soil-vapour Sampling

Samples were collected following PGL's standard field methods and the protocols outlined in ENV *Technical Guidance Document #4 – Vapour Investigation and Remediation (July 2009).* Sub-surface, soil-vapour wells were left to equilibrate after installation for 24-hours prior to sampling. Sub-surface samples were not collected within 24-hours after a significant rain event. Before sampling, helium-leak testing and vacuum testing was conducted.

Sampling took place on October 4, 2021.

Soil-vapour sampling conditions were as follows:

Table L: Soil-vapour Sampling Conditions

Events	Date	Max Temp*(°C)	Min Temp* (°C)	Total Rainfall *(mm)
Day of Event 1	October 4, 2021	14.5	8.5	5.2
One day Prior to Event 1	October 3, 2021	14.5	10	0
One week prior to Event 1	September 28 – October 4, 2021	15	8	43.1

*Recorded at Environment Canada's weather station in Coquitlam, BC

The temperature recorded on the sampling date was slightly cooler than the daily average maximum and minimum temperatures recorded at the warmest time of the year in this area. Canadian climate normals for the area have a daily maximum of 21.2°C and a daily minimum of 13.2°C for that year (recorded in August). Soil-vapour concentrations are highest during warmer times of the year. Based on the air temperatures during sampling, it's expected to see slightly higher concentrations during warmer weather.

13.8 Soil-vapour Variability

Potential implications to soil-vapour data from seasonal effects has been considered. Some variability in the soil-vapour concentrations would be expected, but as results obtained from the October sampling event were well below applicable standards, with most results several orders of magnitude below the applicable standard, or below detection limits, any seasonal changes should not be significant to the results of this investigation.

13.9 Sediment Sampling

PGL retained Coastline Technologies Ltd. (CTI) to provide the boat equipped with a Van-Veen dredge sampling system to collect sediment samples. PGL and CTI collected surficial sediment at 16 sample locations (Figure 3) from 0.25m below surface on November 5, 2021. Sampling locations were recorded via GPS. Sediment samples were submitted to ALS Analytical Services for analysis. Field duplicate sediment samples were analyzed for quality-control purposes.

13.10 Location Survey

Kiewit hired a third-party contractor to complete a survey of all available investigation locations at the Site. Northings, eastings, and elevations at grade and at the top of the well pipe (for groundwater-monitoring wells only) were measured for all investigation locations using a laser level survey. Investigation locations are presented in Figure 3.

13.11 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for data was a significant focus of our work. QA measures applicable to this report included:

- Documentary QA/QC activities by designated personnel, as outlined in the QA/QC form developed by PGL for submissions to the ENV;
- Use of electronically transferred data in all tables (no manual entry); and
- Analysis of duplicate sample results Relative Percent Difference tables presented as Tables A14-1 and A14-4 in Appendix 14, and laboratory internal quality assurance and quality control (provided in laboratory certificates presented in Appendix 15).

Based on a review of the data quality indicators, we conclude that the data quality objectives have been substantially achieved. For those samples that have not met the data quality objectives, specifically a relative percent difference greater than the screening criteria, we concluded in all cases that the increased variability would not affect the conclusions of this report.

Our validated dataset allows us to make valid inferences and conclusions regarding classification of the soil and groundwater at the Site in relation to the CSR standards.

A detailed summary and discussion of the QA/QC findings is provided in Appendix 14.

14.0 INVESTIGATION RESULTS

Minimal contamination was found exceeding CSR standards (zinc in soil and arsenic in water), but because of more stringent standards, a few more CCME exceedances were noted. CCME guidelines exceeded included zinc in PAHs and pH in soil in a few locations, and zinc and a few major ions in groundwater. Not many locations were affected.

14.1 Soils and Geology

Our drilling program identified two soil units across the Site. The stratigraphy can be typically described as:

- Surface – asphalt covers the entire Site;
- Fill: sand and silty sand mixed with and underlain by with woody debris; (1.1-5.7m thickness); and
- Sand silt – to 9m maximum depth.

14.2 Sediment Observations

Surficial sediment was typically grey silt and fine sand with trace wood debris. Two locations (SE-08 and SE-10) had a faint sheen on the water surface. One location, SE-10 consisted of coarse sand (grey), which was different from the other locations.

No specific anthropogenic debris was recovered during sediment sampling except for trace wood debris that was observed mixed with the fine, soft sediments in most locations. There were not significant quantities of bark, or larger wood debris observed in any of the locations.

14.3 Hydrogeology

Site hydrogeology is characterized as an unconfined aquifer hosted in silt material. Water levels were observed between 2.5 and 5.0m below ground surface. Groundwater flow direction is to the south, towards the Fraser River. Additional hydrogeological assessment, including hydraulic conductivity testing, is planned for the Site in support of future development planning and eventual instrument submission to ENV.

14.4 Chemical Results

Localized soil and groundwater contamination was identified in two areas, with slightly more locations identified when the stringent CCME PAH guidelines were applied. We did not identify sediment or soil vapour contamination.

14.4.1 Soil Chemistry

All analyzed samples were compliant with applicable CSR standards for petroleum hydrocarbons, PAHs, metals, VOCs, phenols, and polychlorinated biphenyls (Tables 1–6).

14.4.1.1 Soil Chemistry (CCME Screening)

The more stringent CCME guidelines identified zinc exceedance in one location, PAH exceedances in three locations, and a few scattered pH exceedances. All other analyzed samples were compliant with CCME guidelines for petroleum hydrocarbons, VOCs, phenols, and polychlorinated biphenyls.

Zinc exceeded CCME soil standards for industrial use at BH14M-03 (3.3-3.6m). Zinc was horizontally delineated in soil to the west (BH16M), north (BH17M), east (BH20M), and south (BH19M). It was also vertically delineated at BH18M. When this well at BH14M was destroyed, the replacement drilled location had no contamination, indicating the zinc is highly localized.

Considering federal guidelines for the VFPA parcels (CCME), PAH contamination in soil was identified at BH14M-03 (3.3–3.6m), TH02 (0.3-0.5m), and BH15M-02 (1-1.3m). Concentrations exceeded the CCME soil guidelines (industrial land use, coarse and fine-grained surface soil) for naphthalene at BH14M-03 and BH15M-02, and phenanthrene at BH15M-02 and TH02. Naphthalene and phenanthrene met the CSR soil standards for industrial use.

Scattered pH results were below the CCME range of 6-8 in five locations in the VFPA parcels (BH16M, BH19M, BH20M, TH02 and TH03).

14.4.2 Groundwater Chemistry

Groundwater contamination was limited to arsenic at three locations (Tables 9–14). Dissolved metals contamination in groundwater was identified at BH05M, BH12M and BH13M for arsenic. The identified arsenic contamination exceeded both the CSR groundwater standards for drinking water and freshwater aquatic life.

Arsenic was delineated downgradient towards the Fraser River onsite (BH14M, BH16M, BH18M and BH20M), to the east and west (BH04M and BH06M) and vertically delineated with BH19M; however arsenic concentrations were not delineated upgradient along the northern property line (BH12M and BH13M).

All other analyzed samples were compliant with applicable CSR standards for other metals, petroleum hydrocarbons, PAHs, VOCs, phenols, and glycols.

14.4.2.1 Groundwater Chemistry (Federal Interim Groundwater Guidelines Screening)

Zinc exceeded the Federal Interim Groundwater Guideline at BH14M over multiple events. All other analyzed samples were compliant with applicable CCME guidelines (on VFPA parcels) and CSR standards (for the entire site) for petroleum hydrocarbons, VOCs, phenols, and glycols (Tables 9–14).

14.4.3 Soil-vapour Chemistry

Soil-vapour results met standards after application of sub-slab and/or outdoor air attenuation factors in all locations sampled (Tables 15-17).

14.4.4 Sediment Chemistry

All sediment results met the applicable standards (both CSR and CCME) (Tables 7 and 8).

15.0 DISCUSSION

Considering the investigation results, the following issues warrant further discussion.

15.1 CSR Protocol 9 Background Concentrations in Groundwater

CSR Protocol 9 establishes local background concentrations in groundwater for 27 specified inorganic substances. Concentrations of a substance below the regional estimates specific in Table 1 of Protocol 9 are deemed to occur naturally in groundwater, provided there are no specified point sources of contamination for the parameter in question. The Site is situated in Lower Mainland Sub-Region 1. The applicable Protocol 9 concentrations are listed directly in results for dissolved metals in Table 11. Several parameters including, aluminum, cobalt, copper, iron and manganese and selenium, had sample concentrations exceeding the default CSR standard and/or Federal Interim Groundwater Guideline but were below the applicable regional background concentration listed in Protocol 9 and are therefore not considered contamination in groundwater. No pre-approval submission is required to ENV for this release.

15.2 Zinc at BH14M

Zinc contamination was identified in soil and (CCME) groundwater at BH14M.

To verify the soil contamination the soil sample, BH14M-03 (3.3–3.6m), was reanalysed and the initial exceeding concentration was confirmed by the lab. This was the only sample at the Site which exceeded CSR soil standards.

The groundwater only exceeded CCME zinc standard, as CSR marine standards were determined not to apply. This triggered additional investigation of zinc in groundwater. Groundwater concentrations of zinc at BH14M were consistent with the original result in two events in November 2021. At the time when BH14M was drilled and subsequently sampled, the log sort was in full operation and the location was difficult to access due to large log piles between the main yard and the foreshore. In December 2021 PCLS ceased operations in the area and removed logs, debris, and equipment from this area. It is believed that BH14M was destroyed during this activity because it could not be found in January 2022. The well was a flush mount installation (to avoid log manoeuvring), but the surveyed well casing could not be located after an extensive search (with a metal detector and electromagnetic scanning). The non-paved area was regraded following Site clean-up. It is believed the well has been destroyed.

Lateral and vertical delineation wells were drilled and installed in the locations planned in response to concentrations exceeding the CCME and marine aquatic life standard for zinc at BH14M. An additional well, BH18M, was also added to replicate BH14M. Applicable CSR standards were met, and CCME exceedances remained.

Based on these results, it is believed that the zinc in BH14M groundwater is extremely localized, the result of suspect fill in the one location. The presence of repeated groundwater exceedances in this well limits the opportunity to attribute the contamination to a statistical anomaly which would normally explain this type of occurrence in soil.

15.3 Arsenic Contamination Source and Delineation Upgradient

The source of the arsenic contamination in groundwater is believed to be the former Leeder landfill directly upgradient of the Site based on the following rationale:

- No specific potential sources of arsenic contamination were identified onsite in the Stage 1 PSI review, except for suspect fill;
- Soil samples, including those collected from the fill, do not contain elevated concentrations of arsenic;
- Elevated concentrations of dissolved arsenic are only found in groundwater near the northern property line (upgradient) on the freehold portion of the Site;
- The former Leeder Landfill is immediately upgradient at the northern property line and is a feasible source of groundwater contamination;
- The topography slopes aggressively from the north to the south toward the Fraser River;
- Arsenic has been delineated on Site further south (near the foreshore); and
- Delineation upgradient would require drilling into a known inactive landfill.

We believe that the Site meets the criteria for the Protocol 6 exemption scenario where contamination is sourced offsite and would need to be delineated and/or remediated offsite. A Protocol 6 application for preapproval has been submitted to ENV for consideration.

Investigation further upgradient in the area would be prohibitive for multiple reasons:

- Given the nature of landfills with varying composition, groundwater results from within the landfill itself are likely variable and would be difficult to rely on for a delineation objective;
- Drilling the former landfill in multiple locations may reduce the integrity of the surface cap for the landfill; and
- Additional investigation upgradient in the landfill would not likely change the expected remedial approach, which would be risk management of arsenic contamination in groundwater, especially considering that it is delineated further downgradient.

15.4 Other CCME Exceedances

As noted previously, CCME standards were used for screening since Port lands are Federal jurisdiction. For the parameters relevant here, the CCME standards are more stringent. For these parameters:

- CCME zinc is adequately delineated.
- PAHs slightly exceeded CCME in soil at three of 29 locations for two commonly observed light PAHs, naphthalene and phenanthrene. The locations were non adjacent, and we don't consider these results indicative of contamination.
- pH is just likely extremes of natural variation.

16.0 STAGE 2 AND DSI CONCLUSIONS AND RECOMMENDATIONS

Our Stage 2 PSI identified soil and groundwater contamination at the Site, but no contamination in soil vapour or sediment. Two areas of environmental concern (AECs) are confirmed with contamination exceeding applicable CSR numerical standards (Table M).

Table M: Confirmed Areas of Environmental Concern related to CSR Standards

APEC/AEC			Result
#	Description		
1	Onsite – fill of unknown quality on the VFPA lease hold portions of the Site.	Investigation identified widespread fill including mixed wood waste. Significant fill placement between the 1970s and 1990s prior to the commencement of the log sort operation. Some of this fill was suspected to be sourced from a nearby sawmill. Additional fill in the main log sort area and along the foreshore was likely placed/deposited during the log sort operation over the last 20 years.	**RETAINED AS AEC 1** Marginal CCME exceedances were identified on the VFPA parcel in one location for zinc in soil and groundwater, in two locations for naphthalene and phenanthrene and in three locations for pH (outside the CCME guideline range of 6-8) No CSR exceedances were identified for these parameters or other PCOCs related to fill and wood waste on the freehold or VFPA parcels.
2	Onsite-former Leeder Landfill along the north edge of the Site.	Former Leeder landfill is directly upgradient for the entire length of the Site. The landfill cease operations in the 1980s. Most of the industrial park in this area is situated on the former landfill upgradient. Warehousing and light industrial buildings were constructed during redevelopment of this area for the industrial park starting in the early 1990s.	**RETAINED AS AEC 2** **Arsenic contamination in groundwater** was identified on the freehold along the north boundary of the Site. This contaminated groundwater is believed to originate from the former Leeder Landfill further upgradient. The contamination has been delineated vertically and further downgradient in the VFPA leasehold. No other PCOCs related to the former landfill were identified at the Site.

Dissolved arsenic in groundwater which has not been delineated further upgradient (offsite). Based on the investigation results, we conclude that the arsenic contamination in groundwater originates from the former Leeder Landfill and not from onsite sources, as such, PGL has requested that the Director grant a preapproval (under ENV Protocol 6) not to delineate the arsenic contamination upgradient of the Site. A P6 preapproval application has been submitted to ENV for consideration (Appendix 16).

Seasonal sampling would be required to demonstrate plume stability at the Site. The timing and frequency for additional sampling will be determined following ENV response to the P6 preapproval application. In addition, further evaluation of the identified contamination under a Human Health and Ecological Risk assessment is recommended to secure a ENV risk-based Certificate of Compliance.

This report can be used in the future to support an application to ENV for a Certificate of Compliance along additional supplemental reporting for the work recommended. This report can also be used in support of application to VFPA for a Lease Exit Assessment.

17.0 PROFESSIONAL STATEMENT

This report was prepared, and the investigations were carried out, in accordance with the requirements of the *Environmental Management Act* and BC CSR. This report may be submitted as part of an application for an Approval in Principle or Certificate of Compliance under the Roster of Approved Professionals provisions of the *Environmental Management Act* and the CSR and may be relied upon by the ENV and the Contaminated Sites Approved Professionals Society for this purpose.

18.0 STATEMENT OF LIMITATIONS AND CONDITIONS FOR REPORT

18.1 Complete Report

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to PGL by the Client, communications between PGL and the Client, and any other reports, proposals or documents prepared by PGL for the Client relative to the specific site described herein, all of which together constitute the Report.

In order to properly understand the suggestions, recommendations and opinions expressed herein, reference must be made to the whole of the Report. **PGL is not responsible for use by any part of portions of the Report without reference to the whole report.**

18.2 Basis of Report

The Report has been prepared for the specific site and purposes that are set out in the contract between PGL and the Client. The findings, recommendations, suggestions, or opinions expressed in the Report are only applicable to the site and purposes in relation to which the Report is expressly provided, and then only to the extent that there has been no material alteration to or variation from the information provided or available to PGL.

18.3 Use of the Report

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report or any portion thereof without PGL's written consent, and such use shall be on terms and conditions as PGL may expressly approve. Ownership in and copyright for the contents of the Report belong to PGL. Any use which a third party makes of the Report, is the sole responsibility of such third party. **PGL accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report.**

Respectfully submitted,

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Kim Geeves, M.Sc., P.Ag.
Environmental Consultant

William Gaherty, M.S., P.Eng.
President

CPN/KAG/WDG/ncb/cdf
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Bibliography

Aerial photographs of the area:

Year	Serial No.	Photo No.	Notes
1938	A59389	41	The Site and surrounding area are generally undeveloped and forested. A sawmill is visible farther to the west.
1949	BC791	81	Sawmill activities are expanding to the east, towards the Site. Many log booms are adjacent the Site on the Fraser River.
1954	BC1676	53	Some clearing and filling has begun to the east.
1963	BC5062	237	A roadway is now visible running parallel to the northern Site boundary, with a small addition that enters the eastern portion of the Site down to the river. More clearing and filling is occurring to the north.
1969	BC5322	229	Pilings have been added along the shoreline for the log booms. Significant landfilling is occurring to the west and northwest.
1974	BC5581	29	The area immediately north and northwest of the Site is now cleared and used for landfilling. The Site remains treed and undeveloped.
1979	30BC79001	125	Vegetation has been cleared from the southern half of the Site. A small dock-style structure is now visible at the southern end of the roadway onsite. Landfilling continues to the northwest.
1986	30BCC534	79	The southern half of the Site is revegetated.
1991	FF9131	137	Most of the Site has now been cleared and filled for development. More filling is occurring to the north.
1998	Google Earth		The Site is now used as a log sort. The central portion of the property is used for lumber and wood waste storage. A Quonset hut and small buildings are adjacent the Site entrance. The eastern and westernmost portions of the property remain treed. Warehousing and light industrial development has begun to the north.
2002	Google Earth		The westernmost portion is now cleared and used for lumber storage. Two ramps enter the river onsite. A new building is adjacent the Quonset hut onsite. The foreshore has been filled to create a parking area adjacent the Site buildings. Development continues to the north.

Year	Serial No.	Photo No.	Notes
2007	Google Earth		The north adjacent properties are completed with the current buildings. The sawmill has been cleared and the area farther west has been preloaded for development.
2014	Google Earth		The eastern portion of the Site has now been cleared and is used for storage and parking.
2019	Google Earth		There are no significant changes from the 2014 photograph.

Business Directories for Brigantine Drive, Hartley Avenue and Schooner Street: 2001, 1995, 1991

Surficial Geology of New Westminster, Map 1484A, Geological Survey of Canada, 1976 and 1977

Interviewed:

- Gordon Cawley, PCLS owner since 1992

Site Registry: 0.5km radius area search

Google Earth

https://coquitlam.maps.arcgis.com/

http://maps.gov.bc.ca/ess/sv/wrbc/

Figures


LEY AVENUE
SCHOONER STREET
RIGANTINE DRIVE
Parcel A
Parcel A
Parcel B
Parcel C
Parcel D
Parcel E
F R A S E R R I V E R


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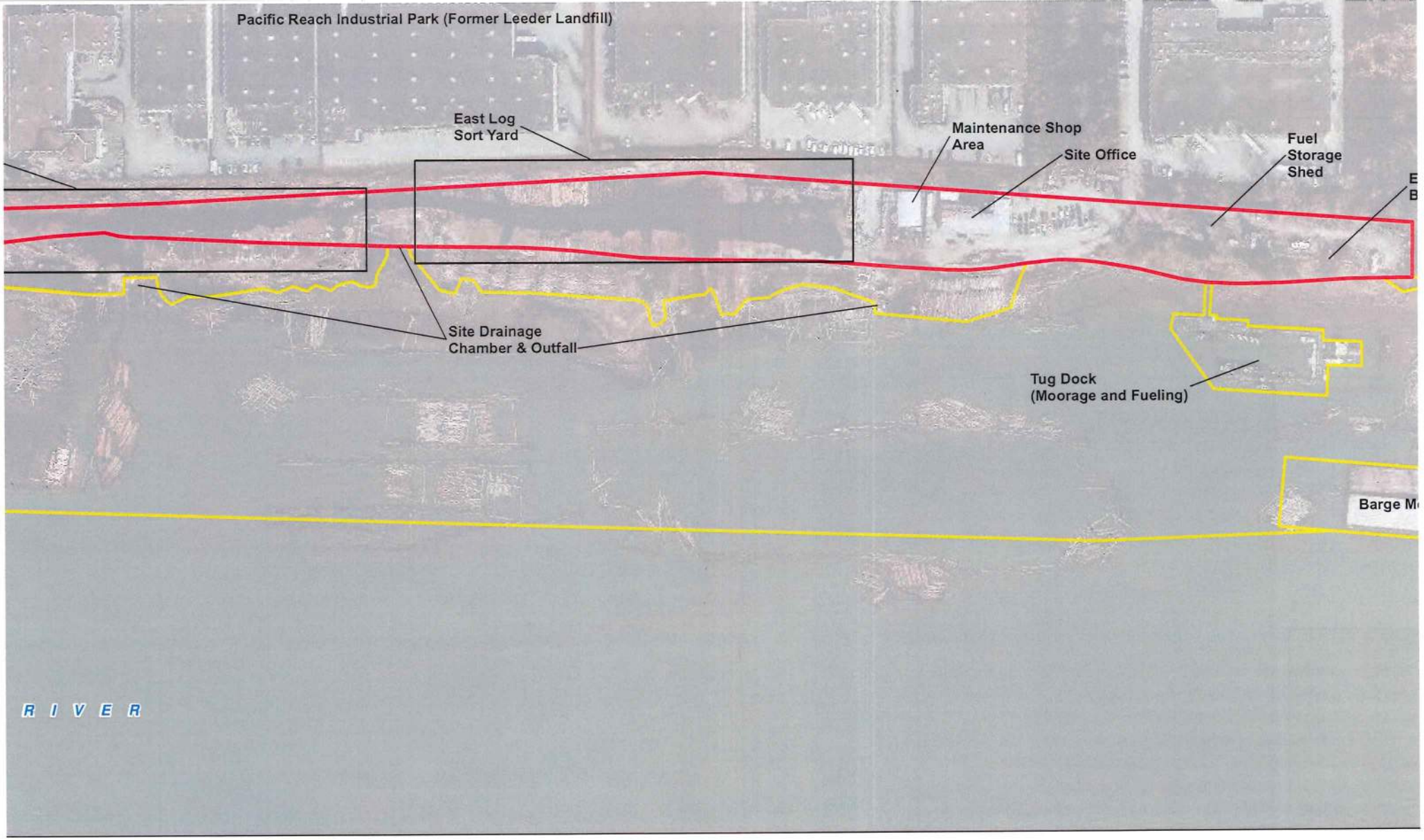
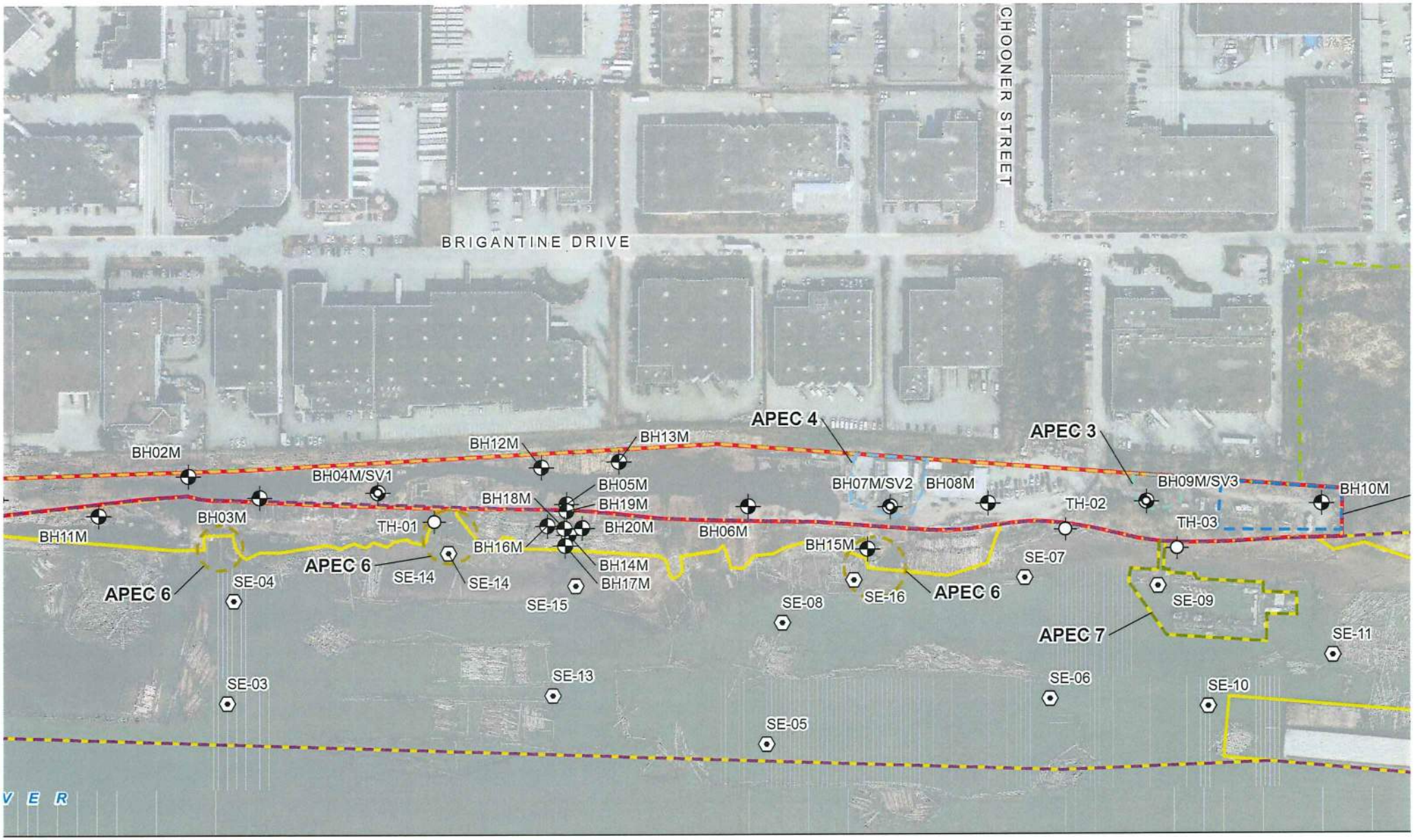

Pacific Reach Industrial Park (Former Leeder Landfill)
East Log
Sort Yard
Maintenance Shop
Area
Site Office
Fuel
Storage
Shed
Site Drainage
Chamber & Outfall
Tug Dock
(Moorage and Fueling)
Barge M
R I V E R



APEC 6

APEC 7

APECs 8 & 9

Monitoring Well

Monitoring Well/Nested Soil Vapour

APEC #	APEC Description		PCOC	Soil	Sediment	Groundwater	Surface Water	Vapour
1	Freehold/VFPA Lease	Imported fill including potential wood waste.	Metals, PAH, Phenols, Chlorophenols	X		X		X
2	Freehold	Former Leeder Landfill along the north edge of the Site.	Metals, PAH, Sulphides	X		X		
3	Freehold	Fuelling shed area including five ASTs containing diesel, gasoline, mixed gasoline and	Metals, LEPH/HEPH, PAH, MAH, VOCs	X		X		X

APEC #	APEC Description		PCOC	Soil	Sediment	Groundwater	Surface Water	Vapour
6	VFPA Lease	Site drainage outfalls in VFPA water lots	Metals, PAH		X			
7	VFPA Lease	On-water repairs, fueling and maintenance on the moored tug vessels.	Metals, LEPH/HEPH, PAH		X			
		General water-						

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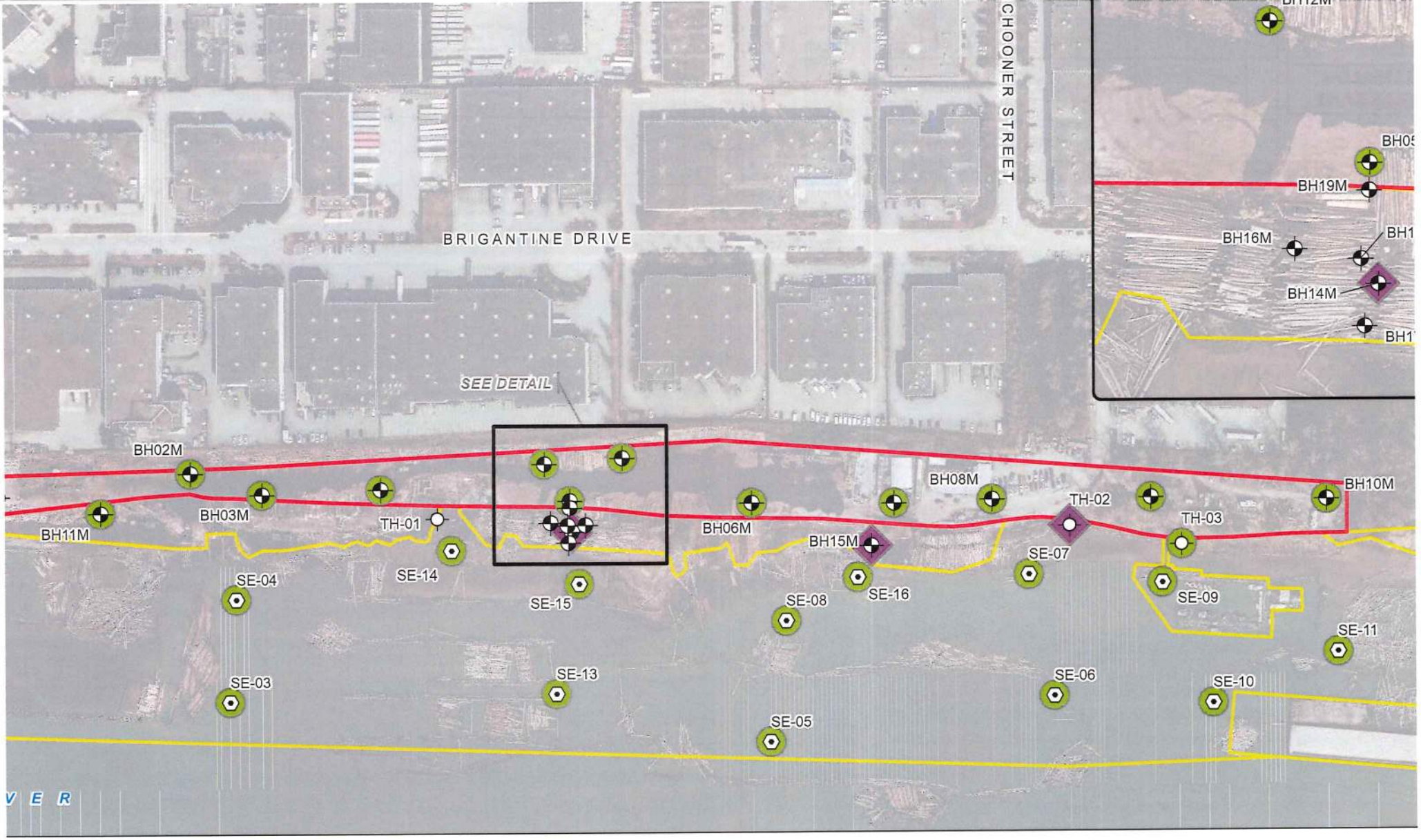

Sample exceeds applicable CCME Soil Guideline, but not applicable CSR standard

	Naphthalene	Phenanthrene	IACR (CCME)
	µg/g	µg/g	mg/kg
RDL	0.01	0.01	0.15
CCME CSQG IL Coarse Grained Surface Soil	**0.013**	**0.046**	**1**
CCME CSQG IL Fine Grained Surface Soil	**0.013**	**0.046**	**1**

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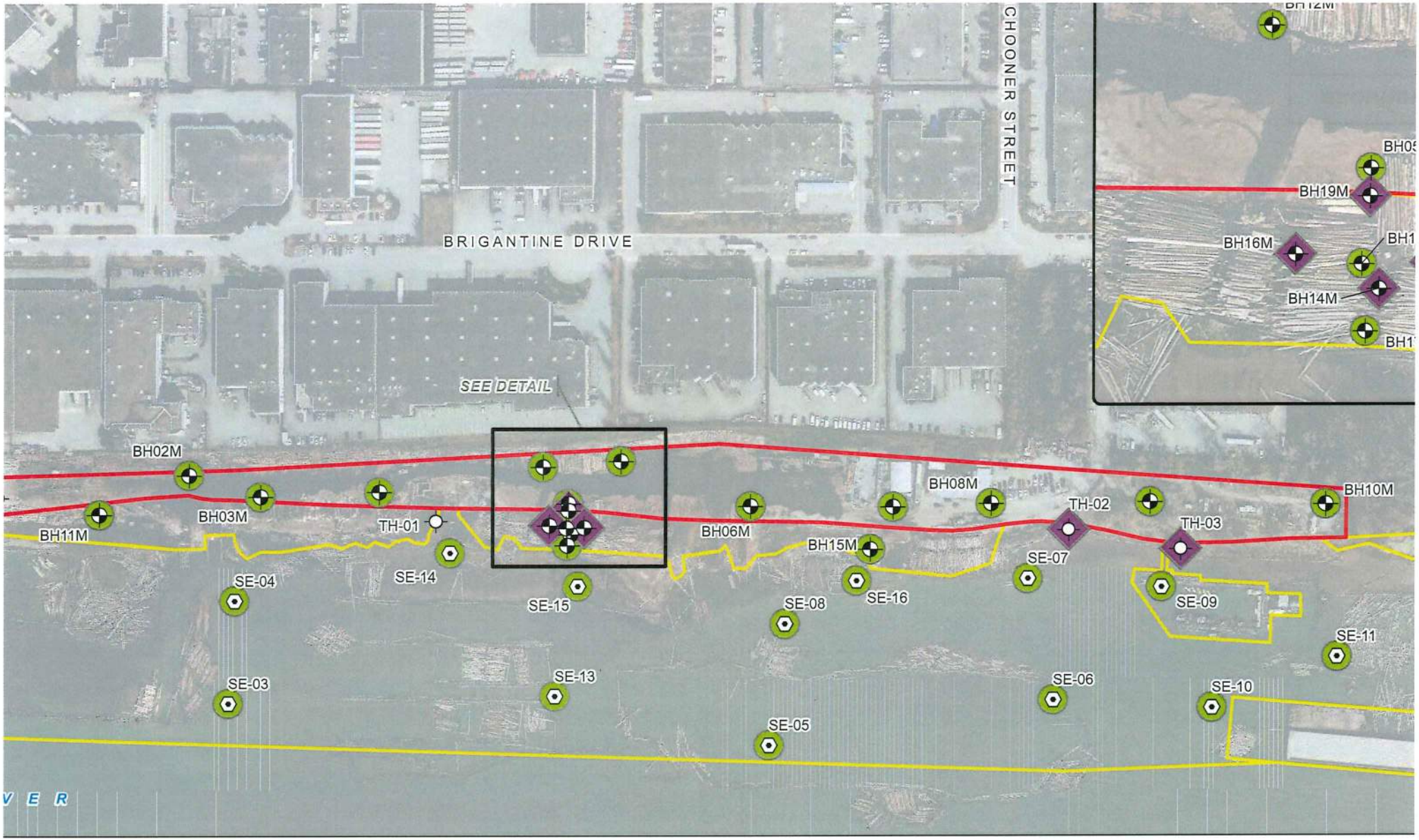

Location	Date	Depth (m)	pH (Lab)	Zinc
BH14M-03	5-Nov-21	3.3-3.6	6.33	224
BH16M-02	14-Jan-22	3-3.3	5.79	36.6
BH19M-01	14-Jan-22	2-2.3	7.98	26.9

	Metals	
	pH (Lab)	Zinc
	pH_Units	µg/g
RDL	0.1	2
CCME CSQG IL Coarse Grained Surface Soil	6-8	410
CCME CSQG IL Fine Grained Surface Soil	6-8	410

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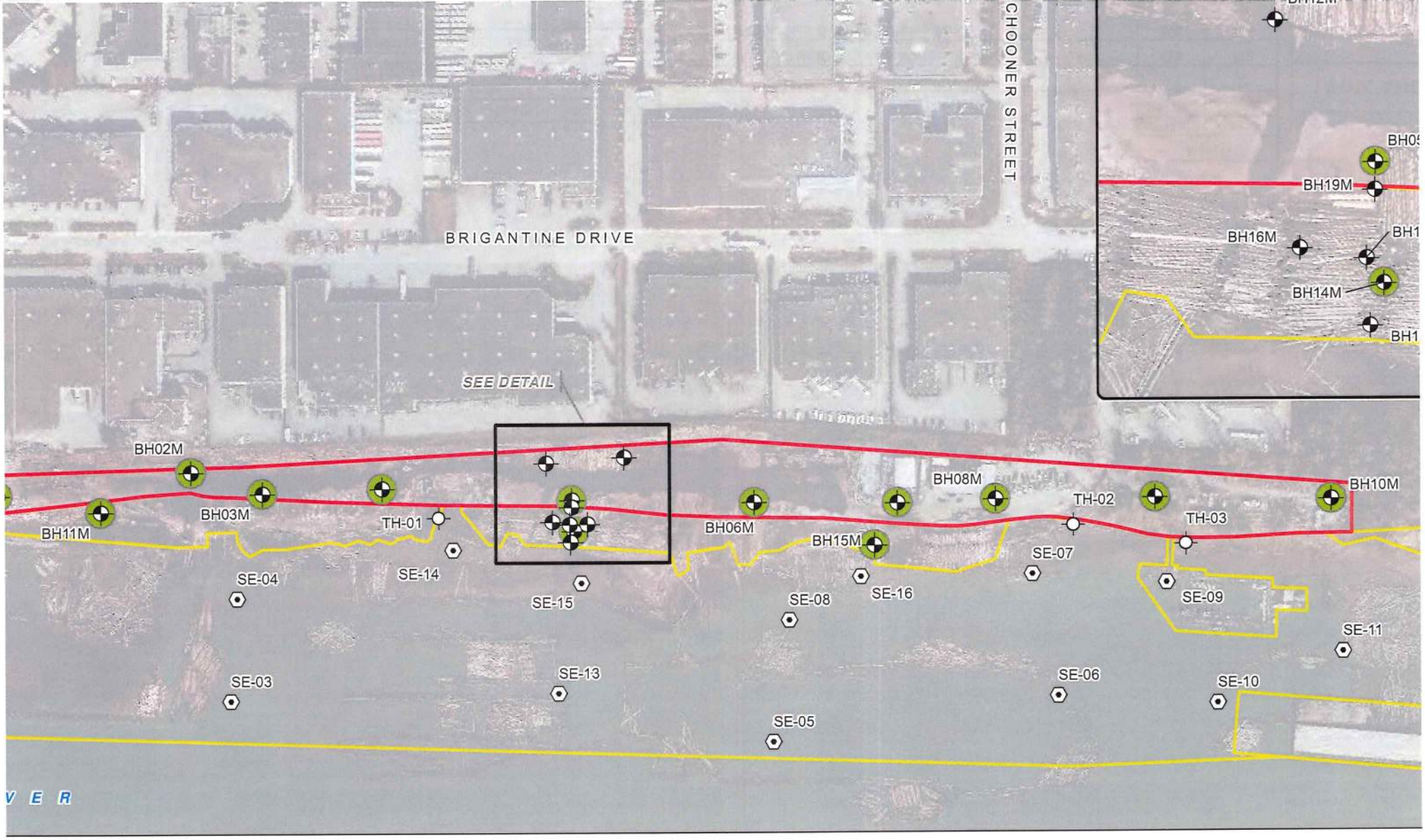
BRIGANTINE DRIVE
CHOONER STREET
SEE DETAIL
BH19M
BH16M
BH14M
BH02M
BH03M
BH11M
TH-01
BH06M
BH08M
BH15M
TH-02
TH-03
BH10M
SE-04
SE-14
SE-15
SE-08
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SE-11
SE-03
SE-13
SE-06
SE-10
SE-05

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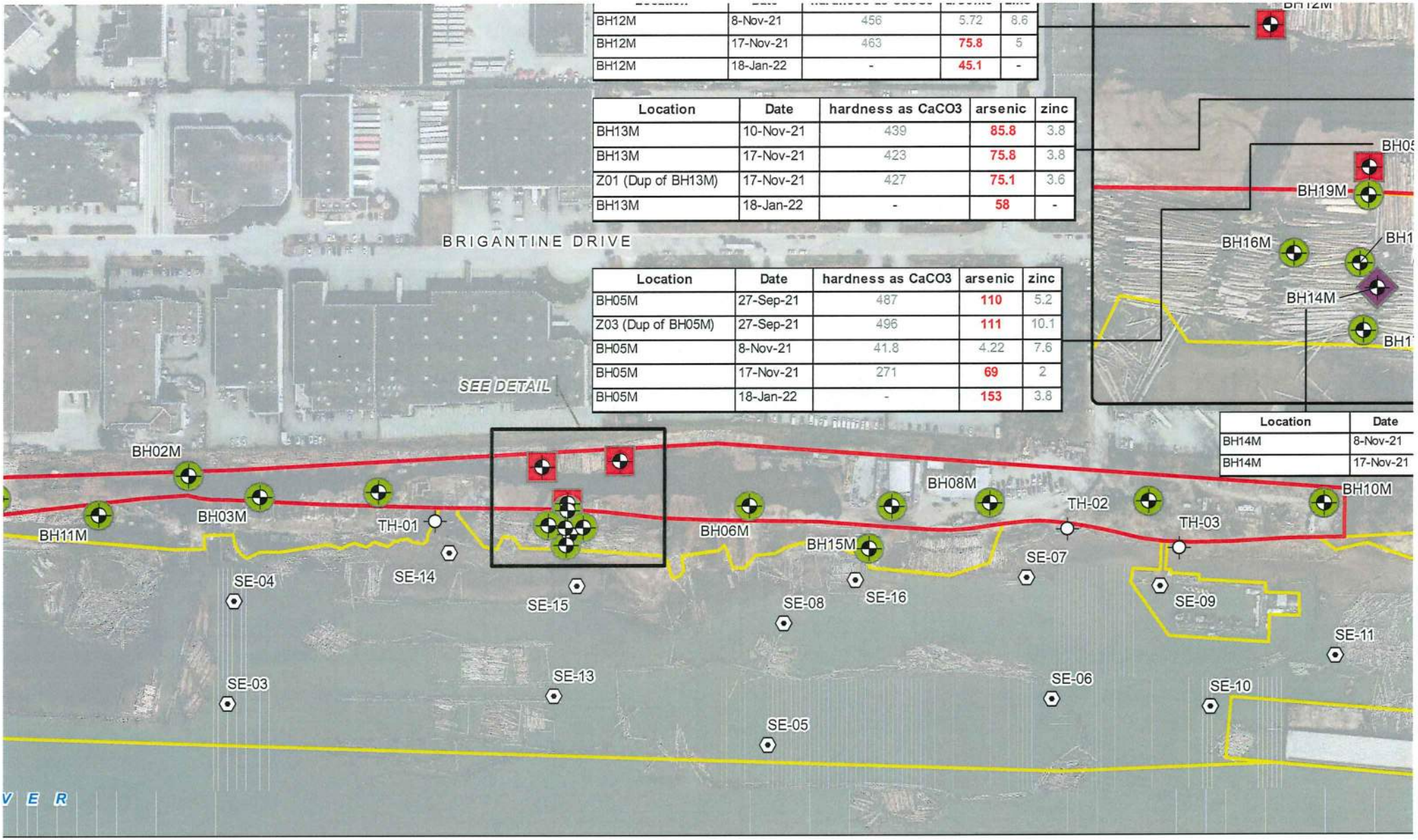

Location	Date	hardness as CaCO3	arsenic	zinc
BH12M	8-Nov-21	456	5.72	8.6
BH12M	17-Nov-21	463	75.8	5
BH12M	18-Jan-22	-	45.1	-

Location	Date	hardness as CaCO3	arsenic	zinc
BH13M	10-Nov-21	439	85.8	3.8
BH13M	17-Nov-21	423	75.8	3.8
Z01 (Dup of BH13M)	17-Nov-21	427	75.1	3.6
BH13M	18-Jan-22	-	58	-

Location	Date	hardness as CaCO3	arsenic	zinc
BH05M	27-Sep-21	487	110	5.2
Z03 (Dup of BH05M)	27-Sep-21	496	111	10.1
BH05M	8-Nov-21	41.8	4.22	7.6
BH05M	17-Nov-21	271	69	2
BH05M	18-Jan-22	-	153	3.8

Location	Date
BH14M	8-Nov-21
BH14M	17-Nov-21

Sample exceeds applicable FIGW Guideline, but not CSR standard

	Metals		
	hardness as CaCO3	arsenic	zinc
	mg/L	µg/L	ug/L
RDL	0.5	0.1	1
CSR Sch 3.2 AW (Freshwater)	-	50	75-2400[2]

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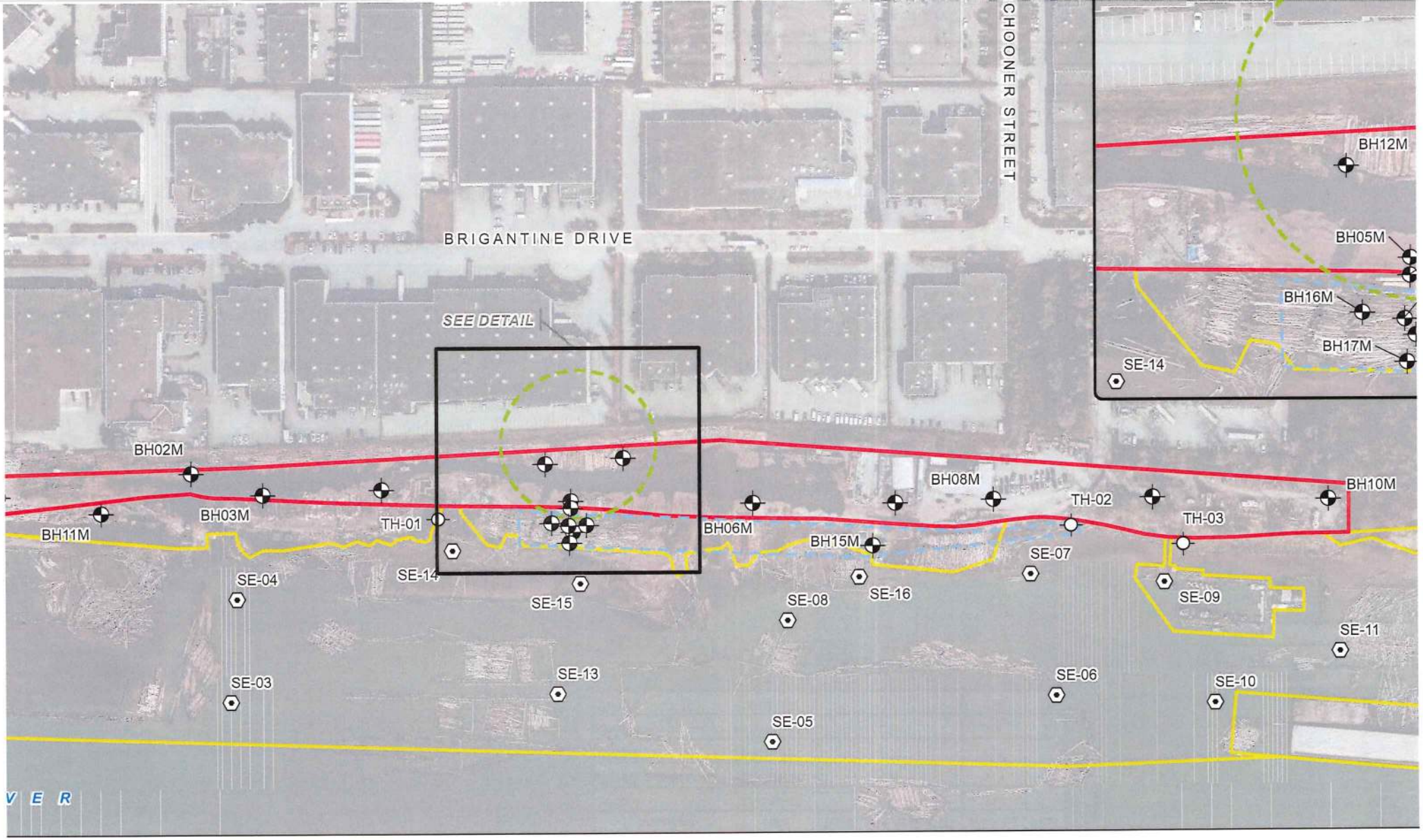

Confirmed AEC	Contaminant of Concern	Matrix	Maximum Measured Concentration (CSR standard in brackets)	Extent of Contamination	
				Area (m2)	Depth Range (m)
AEC 1 Onsite – fill of suspect quality only exceeding CCME guidelines only on the VFPA leasehold parcel	Zinc	Soil	224mg/kg (150mg/kg)	~10	3-4
	Zinc	Groundwater	200ug/L (100ug/L)	~10	~3-6
	Naphthalene	Soil	0.024 ug/L (0.013 ug/L-CCME IL AWf pathway)	Variable (not a cohesive plume)	Variable (not a cohesive plume)
	Phenanthrene	Soil	0.569 ug/L (0.046 ug/L-CCME IL AWf pathway)	Variable (not a cohesive plume)	Variable (not a cohesive plume)

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Tables

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Standard Table Notes
Soil Samples

Soil sample results are presented as mg/kg (ppm) on a dry weight basis.

Shaded & Bold	Greater than the most stringent of the applicable CSR Standard and/or CCME Guideline
Shaded & Bold	Greater than the most stringent applicable CCME Guideline, but below CSR Standard
Bold	Detection limit greater than standard
*	Sample only exceeds the CCME Guideline, however the location is on the the freehold portion of the Site where federal guidelines do not apply.
-	not analyzed
~	no standard
<	Less than the stated detection limit
B(A)P Total Potency Equivalent	benzo(a)pyrene total potency equivalent
BH_M	monitoring well
CCME	Canadian Council of Ministers of the Environment
CSQG	Canadian Soil (or Sediment) Quality Guidelines for the protection of the environment and human health
CSR	Contaminated Sites Regulation (1997, and amendments)
EPH	Extractable Petroleum Hydrocarbons, not corrected for PAH
F1 (C6-C10)	petroleum hydrocarbon fraction 1
F2 (C10-C16)	petroleum hydrocarbon fraction 2
F3 (C16-C34)	petroleum hydrocarbon fraction 3
F4 (C34-C50)	petroleum hydrocarbon fraction 4
GW	groundwater
HEPH	Heavy Extractable Petroleum Hydrocarbons, corrected for PAH
IACR	index of additive cancer risk
IL	industrial land use
LEPH	Light Extractable Petroleum Hydrocarbons, corrected for PAH
m	metres
MAH	monocyclic aromatic hydrocarbons (benzene, ethylbenzene, toluene and xylenes)
MTBE	methyl tert-butyl ether
PAH	polycyclic aromatic hydrocarbons
PEL	probable effect limit
RDL	reportable detection limit
TH	test hole samples
VH C6-C10	Volatile Hydrocarbons
VOC	Volatile Organic Compounds
VPH C6-C10	Volatile Petroleum Hydrocarbons excluding benzene, ethylbenzene, toluene and xylenes
Z	field replicate/duplicate sample

	pH-Dependant Soil Standards						
	Beryllium	Cadmium	Copper	Lead	Nickel	Zinc	Pentachlorophenol (PCP)
Industrial land use							
CSR Sch3.1 Part 1 IL (GW used for drinking water)	pH <5.5 = 1 pH 5.5 - <6.0 = 1.5 pH 6.0 - <6.5 = 4 pH 6.5 - <7.0 = 20 pH 7.0 - <7.5 = 150 pH 7.5 - <8.0 = 1 000 pH >= 8.0 = 2 500	pH <7.0 = 1 pH 7.0 - <7.5 = 4.5 pH 7.5 - <8.0 = 30 pH >=8.0 = 70	pH <5.0 = 250 pH 5.0 - <5.5 = 500 pH 5.5 - <6.0 = 2 000 pH 6.0 - <6.5 = 10 000 pH 6.5 - <7.0 = 50 000 pH >= 7.0 = 100 000	pH <5.5 = 120 pH 5.5 - <6.0 = 150 pH 6.0 - <6.5 = 800 pH 6.5 - <7.0 = 3 500 pH 7.0 - <7.5 = 7 500 pH >= 7.5 = 8 500	pH <7.5 = 70 pH 7.5 - <8.0 = 250 pH >=8.0 = 500	pH <5.0 = 200 pH 5.0 - <5.5 = 250 pH 5.5 - <6.0 = 300 pH 6.0 - <6.5 = 450 pH 6.5 - >7.0 = 600 pH 7.0 - >7.5 = 1 000 pH 7.5 - <8.0 = 3 000 pH >=8.0 = 5 500	pH <5.0 = 300 pH 5.0 - <5.5 = 200 pH 5.5 - <6.0 = 75 pH 6.0 - <6.5 = 9 pH 6.5 - <7.0 = 2.5 pH >= 7.0 = 1.5

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Table 1
Soil Results - Monocyclic and Polycyclic Aromatic Hydrocarbons and Petroleum Hydrocarbons
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	MAH				Petroleum Hydrocarbons												
	Benzene	Toluene	Ethylbenzene	Xylene Total	VH C6-C10	VPH (C6-C10)	EPH C10-C19	EPH C19-C32	LEPH	HEPH	F1(C6-C10)	F1 -BTEX	F2 (C10-C16)	F2-Naphth	F3 (C16-C34)	F3-PAH	F4 (C34-C50)
	µg/g	µg/g	µg/g	µg/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL	0.005	0.05	0.015	0.075	10	10	200	200	200	200	5	5	25	25	50	50	50
CCME CSQG IL Coarse Grained Surface Soil	0.03	0.37	0.082	11	~	~	~	~	~	~	~	~	~	~	~	~	~
CCME CSQG IL Fine Grained Surface Soil	0.0068	0.08	0.018	2.4	~	~	~	~	~	~	~	~	~	~	~	~	~
CWS Tier 1 IL Coarse Grained Surface Soils	~	~	~	~	~	~	~	~	~	~	240	240	260	260	1700	1700	3300
CWS Tier 1 IL Fine Grained Surface Soils	~	~	~	~	~	~	~	~	~	~	170	170	230	230	2500	2500	6600
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)	2.5	0.5	200	20	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 1 (GW used for drinking water)	0.035	6	15	6.5	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)	6500	550000	700000	>1000000	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)	250	450	650	600	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 2 Human Health	~	~	~	~	~	200	2000[1]	5000[1]	2000	5000	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 3 Ecological Health	~	~	~	~	~	200	2000[1]	5000[1]	2000	5000	~	~	~	~	~	~	~
Location	Date	Depth (m)																
BH02M-03	18-Sep-21	2.3-2.6	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH03M-02	18-Sep-21	2-3	-	-	-	-	-	-	260	1630	250	1610	-	-	-	-	-	-	-
BH04M-01	18-Sep-21	0.5-0.8	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH04M-04	18-Sep-21	3.1-3.4	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH05M-02	18-Sep-21	1.5-1.8	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH06M-05	19-Sep-21	3-3.3	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH06M-06	19-Sep-21	3.7-4.1	<0.005	<0.05	<0.015	<0.075	<10	<10	<200	<200	<200	<200	-	-	-	-	-	-	-
BH07M-02	19-Sep-21	0.7-1	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH07M-06	19-Sep-21	3.8-4.1	<0.005	<0.05	<0.015	<0.075	<10	<10	<200	<200	<200	<200	-	-	-	-	-	-	-
Z05 (Dup of BH07M-06)	19-Sep-21	3.8-4.1	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH08M-06	19-Sep-21	4.5-4.8	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH09M-01	19-Sep-21	0.4-0.7	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH09M-04	19-Sep-21	2.7-3	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH09M-05	19-Sep-21	3.9-4.3	<0.005	<0.05	<0.015	<0.075	<10	<10	<200	<200	<200	<200	-	-	-	-	-	-	-
Z06 (Dup of BH09M-05)	19-Sep-21	3.9-4.3	-	-	-	-	-	-	<200	200	<200	200	-	-	-	-	-	-	-
BH10M-01	19-Sep-21	0.3-0.6	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH10M-04	19-Sep-21	2.9-3.2	-	-	-	-	-	-	<200	<200	<200	<200	-	-	-	-	-	-	-
BH11M-02	4-Nov-21	1-1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11M-05	5-Nov-21	6.9-7.2	-	-	-	-	-	-	<200	<200	<200	<200	-	-	<25	<25	<50	<50	<50
Z05 (Dup of BH11M-05)	5-Nov-21	6.9-7.2	-	-	-	-	-	-	<200	<200	<200	<200	-	-	<25	<25	<50	<50	<50
BH12M-02	4-Nov-21	1-1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13M-02	4-Nov-21	1-1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14M-03	5-Nov-21	3.3-3.6	<0.005	<0.05	<0.015	<0.075	-	-	<200	<200	<200	<200	<5	<5	<25	<25	<50	<50	<50
BH15M-02	4-Nov-21	1-1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH15M-04	5-Nov-21	3-3.3	<0.005	<0.05	<0.015	<0.075	-	-	<200	<200	<200	<200	<5	<5	<25	<25	<50	<50	<50
TH02	4-Nov-21	0.3-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TH03	4-Nov-21	0.3-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TH04	4-Nov-21	0.3-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Z01 (Dup of TH04)	4-Nov-21	0.3-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

PGL ENVIRONMENTAL CONSULTANTS

Table 1
Soil Results - Monocyclic and Polycyclic Aromatic Hydrocarbons and Petroleum Hydrocarbons
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

				PAH																				
	Acenaphthene	Acenaphthylene	Acridine	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b/j/k)fluoranthene	Benzo(g,h,i)perylene	B(a)P Total Potency Equivalent	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene	Quinoline	IACR (CCME)
	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	mg/kg	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	mg/kg
RDL	0.005	0.005	0.01	0.004	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15
CCME CSQG IL Coarse Grained Surface Soil	0.28	320	~	32	10	72	~	~	0.6	10	~	10	180	0.25	10	~	~	0.013	0.046	100	~	1
CCME CSQG IL Fine Grained Surface Soil	0.28	320	~	32	10	72	~	~	0.6	10	~	10	180	0.25	10	~	~	0.013	0.046	100	~	1
CWS Tier 1 IL Coarse Grained Surface Soils	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
CWS Tier 1 IL Fine Grained Surface Soils	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	75	~	~	~	~
CSR IL Sch 3.1 Part 1 (GW used for drinking water)	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	100	~	~	~	~
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)	~	~	~	>1000000	~	50	~	~	~	~	~	~	300000	~	~	~	~	150000	~	~	~	~
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)	~	~	~	30	~	70	~	~	~	~	~	~	200	~	~	~	~	20	~	~	~	~
CSR IL Sch 3.1 Part 2 Human Health	15000	~	~	~	500	~	500	~	~	500	4500	50	~	9500	500	1000	950	~	300000	200000	10	~
CSR IL Sch 3.1 Part 3 Ecological Health	~	~	~	~	10	~	10	~	~	10	~	10	~	~	10	~	~	~	50	100	~	~
Location	Date	Depth (m)																						
BH02M-03	18-Sep-21	2.3-2.6	<0.005	<0.005	<0.01	<0.0041	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	0.015	<0.01	<0.01	<0.01	<0.01	0.018*	0.02	0.016	<0.01	<0.15
BH03M-02	18-Sep-21	2-3	1.34*	0.0505	<0.32	1.82	3.38	3.11	2.96	1.22	4.34*	1.1	3.43	0.321	9.09	1.06	1.2	0.282	0.422	0.537*	7.09*	7.59	<0.03	47.7*
BH04M-01	18-Sep-21	0.5-0.8	<0.005	0.011	<0.01	0.0084	0.027	0.024	0.03	0.018	0.035	<0.01	0.026	<0.005	0.042	<0.01	0.016	<0.01	<0.01	0.016*	0.027	0.04	<0.01	0.397
BH04M-04	18-Sep-21	3.1-3.4	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH05M-02	18-Sep-21	1.5-1.8	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH06M-05	19-Sep-21	3-3.3	<0.005	0.0053	<0.01	<0.0067	0.015	0.019	0.029	0.018	0.029	<0.01	0.022	<0.005	0.052	<0.01	0.018	<0.01	<0.01	0.026*	0.039	0.039	0.016	0.34
BH06M-06	19-Sep-21	3.7-4.1	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH07M-02	19-Sep-21	0.7-1	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	0.018	0.015	<0.01	<0.15
BH07M-06	19-Sep-21	3.8-4.1	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
Z05 (Dup of BH07M-06)	19-Sep-21	3.8-4.1	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH08M-06	19-Sep-21	4.5-4.8	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH09M-01	19-Sep-21	0.4-0.7	<0.005	0.122	<0.01	0.0703	0.197	0.238	0.25	0.153	0.354	0.086	0.216	0.0422	0.232	0.011	0.166	<0.01	<0.01	<0.01	0.073*	0.28	<0.01	3.71*
BH09M-04	19-Sep-21	2.7-3	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH09M-05	19-Sep-21	3.9-4.3	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
Z06 (Dup of BH09M-05)	19-Sep-21	3.9-4.3	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH10M-01	19-Sep-21	0.3-0.6	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	0.016	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	0.011	<0.01	<0.15
BH10M-04	19-Sep-21	2.9-3.2	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH11M-02	4-Nov-21	1-1.3	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	0.014	0.01	<0.02	<0.01	<0.01	<0.005	0.016	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.015	<0.01	0.166
BH11M-05	5-Nov-21	6.9-7.2	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
Z05 (Dup of BH11M-05)	5-Nov-21	6.9-7.2	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH12M-02	4-Nov-21	1-1.3	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH13M-02	4-Nov-21	1-1.3	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
BH14M-03	5-Nov-21	3.3-3.6	<0.005	0.0078	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	0.013	<0.01	<0.01	<0.01	<0.01	0.021	0.014	0.013	<0.01	<0.15
BH15M-02	4-Nov-21	1-1.3	0.0155	0.0564	0.013	0.075	0.2	0.23	0.348	0.165	0.357	0.129	0.345	0.0368	0.669	0.068	0.178	0.021	0.02	0.024	0.569	0.642	<0.01	4.62
BH15M-04	5-Nov-21	3-3.3	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15
TH02	4-Nov-21	0.3-0.5	<0.005	<0.005	<0.01	0.0239	0.086	0.059	0.08	0.022	0.089	0.031	0.101	0.0067	0.189	<0.01	0.026	<0.01	<0.01	<0.01	0.05	0.167	<0.01	1.2
TH03	4-Nov-21	0.3-0.5	<0.0057	<0.0057	<0.01	<0.0057	<0.01	<0.01	0.015	<0.01	<0.02	<0.01	0.014	<0.0057	0.024	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	0.014	<0.01	0.175
TH04	4-Nov-21	0.3-0.5	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	0.012	<0.01	<0.02	<0.01	0.014	<0.005	0.019	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	0.015	<0.01	0.155
Z01 (Dup of TH04)	4-Nov-21	0.3-0.5	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.005	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15

PGL ENVIRONMENTAL CONSULTANTS

Table 2
Soil Results - Volatile Organic Compounds
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

			VOC																
			benzo(b+j+k)fluoranthene	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorobenzene	1,1-Dichloroethylene	Chloroethane	Chloroform	Chloromethane	Dibromochloromethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethane	1,2-Dichloroethane	cis-1,2-Dichloroethylene	1,2-Dichloropropane
			mg/kg	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL			0.015	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
CCME CSQG IL Coarse Grained Surface Soil			~	~	~	50	10	50	~	50	~	~	10	10	10	50	50	~	50
CCME CSQG IL Fine Grained Surface Soil			~	~	~	50	10	50	~	50	~	~	10	10	10	50	50	~	50
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)			~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)			~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)			~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
CSR IL Sch 3.1 Part 2 Human Health			~	550	4000	5000	150000	350000	~	70000	~	400	650000	200000	800000	>1000000	350	15000	10000
CSR IL Sch 3.1 Part 3 Ecological Health			~	~	~	50	10	50	~	50	~	~	10	10	10	50	50	50	50
Location	Date	Depth (m)																	
BH06M-06	19-Sep-21	3.7-4.1	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH07M-06	19-Sep-21	3.8-4.1	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH09M-05	19-Sep-21	3.9-4.3	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH14M-03	5-Nov-21	3.3-3.6	<0.015	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH15M-04	5-Nov-21	3-3.3	<0.015	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

PGL
ENVIRONMENTAL CONSULTANTS

Table 2
Soil Results - Volatile Organic Compounds
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	VOC														
	1,3-Dichloropropene	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	trans-1,2-Dichloroethylene	Methyl tert-butyl ether	Methylene Chloride	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Styrene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Tetrachloroethylene	Trichloroethylene	Trichlorofluoromethane	Vinyl Chloride
	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL	0.075	0.05	0.05	0.05	0.04	0.045	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.05	0.05
CCME CSQG IL Coarse Grained Surface Soil	~	~	~	~	~	**50**	~	**50**	**50**	**50**	**50**	**0.6**	**0.01**	~	~
CCME CSQG IL Fine Grained Surface Soil	~	~	~	~	~	**50**	~	**50**	**50**	**50**	**50**	**0.6**	**0.01**	~	~
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)	~	~	~	~	~	~	~	~	~	~	~	**2.5**	**0.3**	~	~
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)	~	~	~	~	~	~	~	~	~	~	~	**40000**	**3500**	~	~
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)	~	~	~	~	~	~	~	~	~	~	~	**30**	**25**	~	~
CSR IL Sch 3.1 Part 2 Human Health	**200000**	**200000**	**200000**	**150000**	**20000**	**40000**	**1500**	**150**	**>1000000**	**>1000000**	**30000**	~	~	**70000**	**45**
CSR IL Sch 3.1 Part 3 Ecological Health	**50**	~	~	**50**	~	**50**	~	~	**50**	**50**	**50**	~	~	~	~
Location	**Date**	**Depth (m)**													
BH06M-06	19-Sep-21	3.7-4.1	<0.075	<0.05	<0.05	<0.05	<0.04	<0.045	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
BH07M-06	19-Sep-21	3.8-4.1	<0.075	<0.05	<0.05	<0.05	<0.04	<0.045	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
BH09M-05	19-Sep-21	3.9-4.3	<0.075	<0.05	<0.05	<0.05	<0.04	<0.045	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
BH14M-03	5-Nov-21	3.3-3.6	<0.075	<0.05	<0.05	<0.05	<0.04	<0.045	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
BH15M-04	5-Nov-21	3-3.3	<0.075	<0.05	<0.05	<0.05	<0.04	<0.045	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05

PGL ENVIRONMENTAL CONSULTANTS

Table 3
Soil Results - Metals
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

			Metals												
			pH (Lab)	Aluminium	Antimony	Arsenic	Barium	Beryllium	Boron (B), Available	Cadmium	Chromium	Cobalt	Copper	Iron	Lead
			pH_Units	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL			0.1	50	0.1	0.1	0.5	0.1	5	0.02	0.5	0.1	0.5	50	0.5
CCME CSQG IL Coarse Grained Surface Soil			**6-8**	**~**	**40**	**12**	**2000**	**8**	**~**	**22**	**87**	**300**	**91**	**~**	**600**
CCME CSQG IL Fine Grained Surface Soil			**6-8**	**~**	**40**	**12**	**2000**	**8**	**~**	**22**	**87**	**300**	**91**	**~**	**600**
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)			**~**	**~**	**~**	**10**	**3500**	**1-500[2]**	**~**	**1-50[2]**	**60[3]**	**25**	**75-7500[2]**	**~**	**200-90000[2]**
CSR IL Sch 3.1 Part 1 (GW used for drinking water)			**~**	**~**	**~**	**10**	**350**	**1-2500[2]**	**~**	**1-70[2]**	**60[3]**	**25**	**250-100000[2]**	**~**	**120-8500[2]**
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)			**~**	**~**	**~**	**400**	**>1000000**	**15000**	**~**	**3500**	**20000**	**2000**	**700000**	**~**	**4000**
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)			**~**	**~**	**~**	**40**	**1500**	**350**	**~**	**75**	**250**	**200**	**300**	**~**	**1000**
CSR IL Sch 3.1 Part 2 Human Health			**~**	**250000**	**40000**	**~**	**~**	**~**	**>1000000**	**~**	**~**	**~**	**~**	**150000**	**~**
CSR IL Sch 3.1 Part 3 Ecological Health			**~**	**~**	**40**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**
Location	**Date**	**Depth (m)**													
BH02M-03	18-Sep-21	2.3-2.6	7.49	14,300	0.47	3.7	91.6	0.22	5.9	0.17	29.4	9.88	31.3	23,200	12.7
BH03M-02	18-Sep-21	2-3	7.97	10,600	0.4	2.46	63.8	0.12	<5	0.077	14.8	6.79	26.4	16,400	7.83
BH04M-01	18-Sep-21	0.5-0.8	6.72	13,300	0.45	4.74	90.9	0.29	<5	0.193	34.6	10.4	25.2	24,500	8.6
BH04M-04	18-Sep-21	3.1-3.4	8.14	12,500	0.4	3.56	93.1	0.33	<5	0.241	48.9	12.8	25.6	17,900	5.49
BH05M-02	18-Sep-21	1.5-1.8	7.06	16,700	0.16	2.6	76.3	0.22	<5	0.041	16.6	6.29	15.1	18,200	2.81
BH06M-05	19-Sep-21	3-3.3	6.25	18,400	0.76	9.93	140	0.41	<5	0.352	45.1	14	33.8	29,700	28
BH06M-06	19-Sep-21	3.7-4.1	7.49	16,200	0.51	4.65	131	0.42	<5	0.259	48.9	14.4	30.7	21,200	6.45
BH07M-02	19-Sep-21	0.7-1	6.45	13,400	0.39	4.91	87.6	0.29	<5	0.181	34.2	10.4	24.1	23,000	5.86
BH07M-06	19-Sep-21	3.8-4.1	7.33	16,000	0.43	3.58	122	0.4	<5	0.22	43.8	13.1	28.4	24,100	6.02
Z05 (Dup of BH07M-06)	19-Sep-21	3.8-4.1	7.42	15,000	0.46	3.41	119	0.37	<5	0.22	41.9	13	28.8	23,900	5.85
BH08M-06	19-Sep-21	4.5-4.8	6.88	9530	0.16	2.89	37.1	0.19	<5	0.122	14.5	7.33	12.3	15,900	2.21
BH09M-01	19-Sep-21	0.4-0.7	7.06	9500	0.25	3.44	53.4	0.18	<5	0.156	26	7.27	15.6	17,600	9.2
BH09M-04	19-Sep-21	2.7-3	6.47	16,600	0.51	4.33	121	0.41	<5	0.284	47	15.3	35	25,700	7.34
BH09M-05	19-Sep-21	3.9-4.3	6.82	16,600	0.59	4.43	120	0.41	<5	0.286	43.8	13.8	33.9	27,500	7
Z06 (Dup of BH09M-05)	19-Sep-21	3.9-4.3	7.04	19,500	0.55	4.92	160	0.46	<5	0.315	51.6	16.3	37	29,900	7.32
BH10M-01	19-Sep-21	0.3-0.6	6.66	25,200	0.75	9.31	156	0.5	5.4	0.406	54.2	16.7	37.6	39,400	27.8
BH10M-04	19-Sep-21	2.9-3.2	6.45	17,200	0.44	3.73	126	0.41	<5	0.228	45.9	14.4	30	25,400	6.09

PGL ENVIRONMENTAL CONSULTANTS

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Soil Results - Metals
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

			Metals												
			pH (Lab)	Aluminium	Antimony	Arsenic	Barium	Beryllium	Boron (B), Available	Cadmium	Chromium	Cobalt	Copper	Iron	Lead
			pH_Units	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL			0.1	50	0.1	0.1	0.5	0.1	5	0.02	0.5	0.1	0.5	50	0.5
CCME CSQG IL Coarse Grained Surface Soil			**6-8**	**~**	**40**	**12**	**2000**	**8**	**~**	**22**	**87**	**300**	**91**	**~**	**600**
CCME CSQG IL Fine Grained Surface Soil			**6-8**	**~**	**40**	**12**	**2000**	**8**	**~**	**22**	**87**	**300**	**91**	**~**	**600**
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)			**~**	**~**	**~**	**10**	**3500**	**1-500[2]**	**~**	**1-50[2]**	**60[3]**	**25**	**75-7500[2]**	**~**	**200-90000[2]**
CSR IL Sch 3.1 Part 1 (GW used for drinking water)			**~**	**~**	**~**	**10**	**350**	**1-2500[2]**	**~**	**1-70[2]**	**60[3]**	**25**	**250-100000[2]**	**~**	**120-8500[2]**
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)			**~**	**~**	**~**	**400**	**>1000000**	**15000**	**~**	**3500**	**20000**	**2000**	**700000**	**~**	**4000**
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)			**~**	**~**	**~**	**40**	**1500**	**350**	**~**	**75**	**250**	**200**	**300**	**~**	**1000**
CSR IL Sch 3.1 Part 2 Human Health			**~**	**250000**	**40000**	**~**	**~**	**~**	**>1000000**	**~**	**~**	**~**	**~**	**150000**	**~**
CSR IL Sch 3.1 Part 3 Ecological Health			**~**	**~**	**40**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**
Location	**Date**	**Depth (m)**													
BH11M-02	4-Nov-21	1-1.3	6.46	29,400	0.31	5.32	114	0.4	<5	0.147	32.1	11.1	23.4	24,300	9.52
BH11M-05	5-Nov-21	6.9-7.2	7.01	10,900	0.19	4.65	39.8	0.18	<5	0.136	17.8	9.23	15.5	18,000	2.28
Z05 (Dup of BH11M-05)	5-Nov-21	6.9-7.2	6.73	10,700	0.19	4.99	36.5	0.19	<5	0.132	18.3	9.4	14.8	18,200	2.25
BH12M-02	4-Nov-21	1-1.3	8.15	13,000	0.12	1.86	54	0.16	<5	0.046	12.9	5.1	10.2	15,400	2.21
BH13M-02	4-Nov-21	1-1.3	7.28	11,400	<0.1	1.78	47.7	0.13	<5	0.043	11.2	4.09	9.42	12,500	2.26
BH14M-03	5-Nov-21	3.3-3.6	6.33	18,800	0.59	9.42	126	0.37	<5	0.288	45.8	15.5	36.5	32,000	7.84
BH15M-02	4-Nov-21	1-1.3	7.88	16,400	0.64	3	119	0.24	<5	0.125	18.7	6.69	19.8	18,600	72
BH15M-04	5-Nov-21	3-3.3	-	15,300	0.46	9.06	108	0.32	<5	0.259	40	14.2	30	25,200	5.82
BH16M-02	14-Jan-22	3-3.3	5.79	-	-	-	-	-	-	-	-	-	-	-	-
BH17M-02	14-Jan-22	3-3.3	6.98	-	-	-	-	-	-	-	-	-	-	-	-
BH18M-02	14-Jan-22	3-3.3	6.16	-	-	-	-	-	-	-	-	-	-	-	-
BH19M-01	14-Jan-22	2-2.3	7.98	-	-	-	-	-	-	-	-	-	-	-	-
BH19M-02	14-Jan-22	3-3.3	5.86	-	-	-	-	-	-	-	-	-	-	-	-
BH19M-03	14-Jan-22	4-4.3	6.98	-	-	-	-	-	-	-	-	-	-	-	-
BH20M-02	14-Jan-22	3-3.3	5.18	-	-	-	-	-	-	-	-	-	-	-	-
TH02	4-Nov-21	0.3-0.5	5.51	9880	0.38	4.48	73.4	0.19	<5	0.215	24.7	9	20.8	16,100	3.47
TH03	4-Nov-21	0.3-0.5	5.92	18,600	0.64	8.87	149	0.38	<5	0.236	41.3	15.3	34.6	33,300	12.8
TH04	4-Nov-21	0.3-0.5	6.4	17,800	0.65	8.98	130	0.37	<5	0.338	44.7	15.2	38.4	32,300	11.4
Z01 (Dup of TH04)	4-Nov-21	0.3-0.5	6.41	19,500	0.66	8.03	134	0.39	<5	0.359	46.3	14.4	37.6	32,000	12.7

PGL ENVIRONMENTAL CONSULTANTS

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	Metals													
	Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
	mg/kg	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL	2	1	0.005	0.1	0.5	0.2	0.1	0.5	0.05	2	0.5	0.05	0.2	2
CCME CSQG IL Coarse Grained Surface Soil	**~**	**~**	**50**	**40**	**89**	**2.9**	**40**	**~**	**1**	**300**	**~**	**300**	**130**	**410**
CCME CSQG IL Fine Grained Surface Soil	**~**	**~**	**50**	**40**	**89**	**2.9**	**40**	**~**	**1**	**300**	**~**	**300**	**130**	**410**
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)	**~**	**~**	**~**	**650**	**90-9500[2]**	**1**	**~**	**~**	**~**	**~**	**~**	**150**	**~**	**150-3000[2]**
CSR IL Sch 3.1 Part 1 (GW used for drinking water)	**~**	**2000**	**~**	**15**	**70-500[2]**	**1**	**~**	**~**	**~**	**~**	**~**	**30**	**100**	**200-5500[2]**
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)	**~**	**>1000000**	**2000**	**35000**	**80000**	**35000**	**~**	**~**	**~**	**~**	**~**	**20000**	**35000**	**>1000000**
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)	**~**	**2000**	**75**	**150**	**250**	**2**	**~**	**~**	**~**	**~**	**~**	**2000**	**300**	**450**
CSR IL Sch 3.1 Part 2 Human Health	**450**	**~**	**~**	**~**	**~**	**~**	**35000**	**150000**	**~**	**>1000000**	**200**	**~**	**~**	**~**
CSR IL Sch 3.1 Part 3 Ecological Health	**~**	**~**	**~**	**~**	**~**	**~**	**40**	**~**	**25**	**300**	**~**	**~**	**~**	**~**
Location	Date	Depth (m)												
BH02M-03	18-Sep-21	2.3-2.6	10	528	0.028	1.54	25.7	<0.2	<0.1	62.3	0.059	<2	<0.5	0.547	60.4	72.2
BH03M-02	18-Sep-21	2-3	6	249	0.0156	1.12	11.6	<0.2	<0.1	46.8	<0.05	<2	4.07	0.392	46.5	73.7
BH04M-01	18-Sep-21	0.5-0.8	12	436	0.0399	0.65	34.4	0.28	<0.1	49	0.072	<2	<0.5	0.654	54.5	67.8
BH04M-04	18-Sep-21	3.1-3.4	12.7	247	0.0397	0.48	44.3	0.87	<0.1	38.3	0.075	<2	<0.5	0.585	64	60.8
BH05M-02	18-Sep-21	1.5-1.8	6	313	0.0129	0.21	10.3	<0.2	<0.1	49.3	0.05	<2	<0.5	0.379	53.4	31.4
BH06M-05	19-Sep-21	3-3.3	17.2	513	0.085	0.99	44.5	0.36	0.12	64.6	0.097	4	<0.5	0.868	63.3	85.1
BH06M-06	19-Sep-21	3.7-4.1	14.2	247	0.0626	0.79	47.7	0.38	0.11	54.5	0.104	<2	<0.5	0.837	65.7	72.8
BH07M-02	19-Sep-21	0.7-1	11.7	324	0.0368	0.51	35	0.23	<0.1	44.4	0.073	<2	<0.5	0.639	52.2	58.5
BH07M-06	19-Sep-21	3.8-4.1	15.9	387	0.102	0.77	43.8	0.32	<0.1	55.3	0.097	<2	<0.5	0.922	60.8	68.5
Z05 (Dup of BH07M-06)	19-Sep-21	3.8-4.1	15.2	390	0.0423	0.77	43.3	0.34	<0.1	52.6	0.097	<2	<0.5	0.832	57.7	68.3
BH08M-06	19-Sep-21	4.5-4.8	8.4	288	0.0165	0.19	21.7	<0.2	<0.1	19.3	0.118	<2	<0.5	0.199	39.9	33.8
BH09M-01	19-Sep-21	0.4-0.7	7.8	342	0.0332	0.38	26.2	<0.2	<0.1	24.6	<0.05	<2	<0.5	0.292	41.8	41.3
BH09M-04	19-Sep-21	2.7-3	17.6	317	0.0515	0.88	53.2	0.35	0.12	51.5	0.106	<2	<0.5	0.85	61.5	76.1
BH09M-05	19-Sep-21	3.9-4.3	17.4	352	0.05	0.78	48.3	0.44	0.11	48.5	0.106	<2	<0.5	0.908	58.6	72.7
Z06 (Dup of BH09M-05)	19-Sep-21	3.9-4.3	18.3	405	0.0584	0.87	58.4	0.42	0.12	61.2	0.114	<2	<0.5	0.925	68.5	80.6
BH10M-01	19-Sep-21	0.3-0.6	25.8	780	0.0622	1.48	45.3	0.42	0.14	58.8	0.123	<2	<0.5	0.974	80.5	125
BH10M-04	19-Sep-21	2.9-3.2	16.3	295	0.0465	0.76	48.3	0.33	<0.1	56.9	0.094	<2	<0.5	0.907	62.2	69.8

PGL ENVIRONMENTAL CONSULTANTS

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	Metals													
	Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
	mg/kg	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL	2	1	0.005	0.1	0.5	0.2	0.1	0.5	0.05	2	0.5	0.05	0.2	2
CCME CSQG IL Coarse Grained Surface Soil	~	~	50	40	89	2.9	40	~	1	300	~	300	130	410
CCME CSQG IL Fine Grained Surface Soil	~	~	50	40	89	2.9	40	~	1	300	~	300	130	410
CSR IL Sch 3.1 Part 1 (GW flow to fresh SW used by aquatic life)	~	~	~	650	90-9500[2]	1	~	~	~	~	~	150	~	150-3000[2]
CSR IL Sch 3.1 Part 1 (GW used for drinking water)	~	2000	~	15	70-500[2]	1	~	~	~	~	~	30	100	200-5500[2]
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)	~	>1000000	2000	35000	80000	35000	~	~	~	~	~	20000	35000	>1000000
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)	~	2000	75	150	250	2	~	~	~	~	~	2000	300	450
CSR IL Sch 3.1 Part 2 Human Health	450	~	~	~	~	~	35000	150000	~	>1000000	200	~	~	~
CSR IL Sch 3.1 Part 3 Ecological Health	~	~	~	~	~	~	40	~	25	300	~	~	~	~
Location	Date	Depth (m)												
BH11M-02	4-Nov-21	1-1.3	11.9	460	0.0773	0.72	22.6	0.45	0.16	33.7	0.079	<2	<0.5	0.538	68.3	70
BH11M-05	5-Nov-21	6.9-7.2	7.8	310	0.0234	0.21	25.7	<0.2	<0.1	21.3	<0.05	<2	<0.5	0.204	45.7	41.9
Z05 (Dup of BH11M-05)	5-Nov-21	6.9-7.2	8.4	309	0.017	0.19	25.9	<0.2	<0.1	19.9	0.05	<2	<0.5	0.209	44.8	40.5
BH12M-02	4-Nov-21	1-1.3	4	266	<0.005	0.14	8.41	<0.2	<0.1	48.4	<0.05	<2	<0.5	0.374	43.6	26.3
BH13M-02	4-Nov-21	1-1.3	3.6	224	0.01	0.16	7.22	<0.2	<0.1	37.4	<0.05	<2	<0.5	0.274	38.2	23.3
BH14M-03	5-Nov-21	3.3-3.6	18.7	479	0.0496	0.96	48.1	0.36	0.11	52.8	0.097	<2	<0.5	0.827	64.5	222
BH15M-02	4-Nov-21	1-1.3	6.9	361	0.0517	0.37	11.4	<0.2	<0.1	45	0.061	<2	<0.5	0.392	47.7	73.2
BH15M-04	5-Nov-21	3-3.3	12.8	368	0.0336	0.82	45.2	0.27	<0.1	43.9	0.085	<2	<0.5	0.694	61	66.4
BH16M-02	14-Jan-22	3-3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	36.6
BH17M-02	14-Jan-22	3-3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	64.7
BH18M-02	14-Jan-22	3-3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	80.3
BH19M-01	14-Jan-22	2-2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	26.9
BH19M-02	14-Jan-22	3-3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	61.6
BH19M-03	14-Jan-22	4-4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	47.4
BH20M-02	14-Jan-22	3-3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	66.8
TH02	4-Nov-21	0.3-0.5	6.8	253	0.0254	0.64	27.4	0.21	<0.1	36	0.062	<2	<0.5	0.611	41.4	97
TH03	4-Nov-21	0.3-0.5	16.4	724	0.0513	1.7	43	0.41	0.11	55	0.098	<2	<0.5	1.15	65	76.8
TH04	4-Nov-21	0.3-0.5	15.5	446	0.0561	0.94	48	0.33	0.11	50.8	0.092	<2	<0.5	0.709	63.6	88.1
Z01 (Dup of TH04)	4-Nov-21	0.3-0.5	17	411	0.0626	0.87	46	0.32	0.11	56.5	0.102	<2	<0.5	0.768	65.9	91.6

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Table 4
Soil Results - Physical Parameters
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

			Physical Parameters	
			< 75 µm	% >75um
			%	%
RDL			1	1
Location	**Date**	**Depth (m)**		
BH11M-05	5-Nov-21	6.9-7.2	4.5	95.4
Z05 (Dup of BH11M-05)	5-Nov-21	6.9-7.2	1.6	98.4
BH14M-03	5-Nov-21	3.3-3.6	95.9	4.1
BH15M-04	5-Nov-21	3-3.3	81.3	18.6

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Table 5
Soil Results - Phenols
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	Phenols																		
	Pentachlorophenol	2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,3,4,6-tetrachlorophenol	2-chlorophenol	3-Chlorophenol	4-chlorophenol	2,3-Dichlorophenol	2,4 & 2,5-Dichlorophenol	2,6-dichlorophenol	3,4-Dichlorophenol	3,5-Dichlorophenol	2,3,4-Trichlorophenol	2,3,5-Trichlorophenol	4-chloro-3-methylphenol	2,3,6-Trichlorophenol	3,4,5-Trichlorophenol	2,3,4,5-tetrachlorophenol	2,3,5,6-Tetrachlorophenol
	mg/kg	mg/kg	mg/kg	µg/g	mg/kg	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
RDL	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
CCME CSQG IL Coarse Grained Surface Soil	**7.6**	**~**	**5**	**5**	**~**	**~**	**~**	**~**	**5**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**
CCME CSQG IL Fine Grained Surface Soil	**7.6**	**~**	**5**	**5**	**~**	**~**	**~**	**~**	**5**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)	**900**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)	**55**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**	**~**
CSR IL Sch 3.1 Part 2 Human Health	**~**	**700000**	**7000**	**200000**	**35000**	**20000**	**20000**	**20000**	**~**	**20000**	**20000**	**20000**	**7000**	**7000**	**25000**	**7000**	**7000**	**20000**	**20000**
CSR IL Sch 3.1 Part 3 Ecological Health	**~**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**~**	**5**	**5**	**5**	**5**	**5**	**~**	**5**	**5**	**5**	**5**
Location	**Date**	**Depth (m)**																		
BH02M-03	18-Sep-21	2.3-2.6	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH03M-02	18-Sep-21	2-3	<0.02	<0.02	<0.02	<0.02	<0.06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH04M-01	18-Sep-21	0.5-0.8	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH04M-04	18-Sep-21	3.1-3.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH06M-05	19-Sep-21	3-3.3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH07M-06	19-Sep-21	3.8-4.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Z05 (Dup of BH07M-06)	19-Sep-21	3.8-4.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH09M-04	19-Sep-21	2.7-3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH09M-05	19-Sep-21	3.9-4.3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Z06 (Dup of BH09M-05)	19-Sep-21	3.9-4.3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

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Table 6
Soil Results - Polychlorinated Biphenols
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

				PCB								
				Arochlor 1221	Arochlor 1268	Arochlor 1016	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	Aroclor 1262	PCBs (Sum of total)
				mg/kg	mg/kg	µg/g	mg/kg	µg/g	mg/kg	mg/kg	mg/kg	µg/g	µg/g
RDL				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
CCME CSQG IL Coarse Grained Surface Soil				~	~	~	~	~	~	~	~	~	**33**
CCME CSQG IL Fine Grained Surface Soil				~	~	~	~	~	~	~	~	~	**33**
CSR IL Sch 3.1 Part 1 (Intake of Contam Soil)				~	~	~	~	~	~	~	~	~	**900**
CSR IL Sch 3.1 Part 1 (Toxicity to soil invertebrates and plants)				~	~	~	~	~	~	~	~	~	**35**
Location	**Date**	**Depth (m)**											
BH09M-01	19-Sep-21	0.4-0.7		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Standard Table Notes
Sediment Results

Sediment sample results are presented as mg/kg (ppm) on a dry weight basis.

Shaded & Bold	Greater than the most stringent of the applicable Sch 3.4 Standard and CSQG Guideline
Shaded & Bold	Greater than the most stringent applicable CCME Guideline, but below CSR Standard
Bold	Detection limit greater than standard
-	not analyzed
~	no standard
<	Less than the stated detection limit
CCME	Canadian Council of Ministers of the Environment
CSQG	Canadian Soil (or Sediment) Quality Guidelines for the protection of the environment and human health
CSR	Contaminated Sites Regulation (1997, and amendments)
IACR	index of additive cancer risk
m	metres
PAH	polycyclic aromatic hydrocarbons
PEL	probable effect limit
RDL	reportable detection limit
SE	sediment sample
Z	field replicate/duplicate sample

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Table 7
Sediment Results - Poycyclic Aromatic Hydrocarbons
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	PAH																								
	Methylnaphthalenes	methylnaphthalene, 1-	methylnaphthalene, 2-	acenaphthene	acenaphthylene	acridine	anthracene	benz(a)anthracene	benzo(a)pyrene	benzo(b+j+k)fluoranthene	benzo(ghi)perylene	benzo(b+j)fluoranthene	benzo(k)fluoranthene	chrysene	dibenz(a,h)anthracene	fluoranthene	fluorene	indeno(1,2,3-cd)pyrene	naphthalene	phenanthrene	pyrene	quinoline	IACR (CCME)	B(A)P Total Potency Equivalent
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
RDL	0.015	0.01	0.01	0.005	0.005	0.01	0.004	0.01	0.01	0.015	0.01	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15	0.02
CCME CSQG Sediment FW PEL	~	~	**0.201**	**0.0889**	**0.128**	~	**0.245**	**0.385**	**0.782**	~	~	~	~	**0.862**	**0.135**	**2.355**	**0.144**	~	**0.391**	**0.515**	**0.875**	~	~	~
CCME CSQG Sediment Marine PEL	~	~	**0.201**	**0.0889**	**0.128**	~	**0.245**	**0.693**	**0.763**	~	~	~	~	**0.846**	**0.135**	**1.494**	**0.144**	~	**0.391**	**0.544**	**1.398**	~	~	~
CSR Sch 3.4 Freshwater Typical Use	~	~	**0.24**	**0.11**	**0.15**	~	**0.29**	**0.46**	**0.94**	~	~	~	~	**1**	**0.16**	**2.8**	**0.17**	~	**0.47**	**0.62**	**1.1**	~	~	~
CSR Sch 3.4 Marine Typical Use	~	~	**0.24**	**0.11**	**0.15**	~	**0.29**	**0.83**	**0.92**	~	~	~	~	**1**	**0.16**	**1.8**	**0.17**	~	**0.47**	**0.65**	**1.7**	~	~	~
Location	**Date**	**Depth (m)**																							
SE-01	5-Nov-2021	4.8-5	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.012	<0.01	<0.01	<0.01	0.017	<0.01	<0.01	<0.15	<0.02
SE-02	5-Nov-2021	2.92-3.02	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.018	<0.01	<0.01	<0.01	0.015	0.019	<0.01	<0.15	<0.02
SE-03	5-Nov-2021	5-5.2	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	0.012	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.151	<0.02
SE-04	5-Nov-2021	4.78-4.98	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.011	<0.01	<0.01	<0.01	0.013	0.01	<0.01	<0.15	<0.02
SE-05	5-Nov-2021	4.62-4.82	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.022	<0.01	<0.01	<0.01	0.015	0.019	<0.01	<0.15	<0.02
SE-06	5-Nov-2021	4.48-4.68	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.014	<0.01	<0.01	<0.01	0.012	0.012	<0.01	<0.15	<0.02
SE-07	5-Nov-2021	4.2-4.4	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15	<0.02
Z01 (Dup of SE-07)	5-Nov-2021	4.2-4.4	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15	<0.02
SE-08	5-Nov-2021	2.4-2.6	<0.015	<0.01	<0.01	0.0076	<0.005	<0.01	0.0079	<0.01	<0.012	0.015	0.011	0.015	<0.01	0.014	<0.005	0.053	0.01	<0.01	<0.01	0.049	0.045	<0.01	0.177	<0.02
SE-09	5-Nov-2021	6.03-6.23	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.017	<0.01	<0.01	<0.01	0.015	0.016	<0.01	<0.15	<0.02
SE-10	5-Nov-2021	6.39-6.59	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15	<0.02
SE-11	5-Nov-2021	2.95-3.15	<0.015	<0.01	<0.01	0.0063	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.018	<0.01	<0.01	<0.01	0.02	0.015	<0.01	<0.15	<0.02
SE-12	5-Nov-2021	2.02-2.22	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.019	<0.01	<0.01	<0.01	0.016	0.018	<0.01	<0.15	<0.02
Z02 (Dup of SE-12)	5-Nov-2021	2.02-2.22	<0.015	<0.01	<0.01	<0.0054	<0.0054	<0.01	<0.0054	<0.01	<0.01	<0.015	<0.01	0.013	<0.01	<0.01	<0.0054	0.023	<0.01	<0.01	<0.01	0.02	0.023	<0.01	0.158	<0.02
SE-13	5-Nov-2021	3.24-3.44	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.0051	<0.01	<0.01	<0.015	<0.01	0.01	<0.01	<0.01	<0.005	0.024	<0.01	<0.01	<0.01	0.024	0.023	<0.01	<0.15	<0.02
SE-14	5-Nov-2021	0.54-0.74	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.15	<0.02
SE-15	5-Nov-2021	3.59-3.79	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.015	<0.01	<0.01	<0.01	0.015	0.015	<0.01	<0.15	<0.02
SE-16	5-Nov-2021	3.15-3.35	<0.015	<0.01	<0.01	<0.005	<0.005	<0.01	<0.004	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.005	0.018	<0.01	<0.01	<0.01	0.018	0.018	<0.01	<0.15	<0.02

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Table 8
Sediment Results - Metals
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

			Metals																										
			pH (lab)	aluminium	antimony	arsenic	barium	beryllium	boron	cadmium	chromium	cobalt	copper	iron	lead	lithium	manganese	mercury	molybdenum	nickel	selenium	silver	strontium	thallium	tin	tungsten	uranium	vanadium	zinc
			pH_Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
RDL			0.1	50	0.1	0.1	0.5	0.1	5	0.02	0.5	0.1	0.5	50	0.5	2	1	0.005	0.1	0.5	0.2	0.1	0.5	0.05	2	0.5	0.05	0.2	2
CCME CSQG Sediment FW PEL			~	~	~	17	~	~	~	3.5	90	~	197	~	91.3	~	~	0.486	~	~	~	~	~	~	~	~	~	~	315
CCME CSQG Sediment Marine PEL			~	~	~	41.6	~	~	~	4.2	160	~	108	~	112	~	~	0.7	~	~	~	~	~	~	~	~	~	~	271
CSR Sch 3.4 Freshwater Typical Use			~	~	~	20	~	~	~	4.2	110	~	240	~	110	~	~	0.58	~	~	~	~	~	~	~	~	~	~	380
CSR Sch 3.4 Marine Typical Use			~	~	~	50	~	~	~	5	190	~	130	~	130	~	~	0.84	~	~	~	~	~	~	~	~	~	~	330
Location	**Date**	**Depth (m)**																											
SE-01	5-Nov-2021	4.8-5	7.86	17,000	0.48	6.08	119	0.36	<5	0.21	43.1	14.4	32.4	31,500	6.13	15.6	586	0.0421	0.68	49	0.28	<0.1	60.7	0.083	<2	<0.5	0.724	58.9	73.4
SE-02	5-Nov-2021	2.92-3.02	7.48	15,400	0.45	5.61	114	0.33	<5	0.222	43	13.8	32.5	29,300	6.03	13.8	445	0.042	0.67	48.4	0.3	<0.1	53.5	0.08	<2	<0.5	0.792	56.4	76.4
SE-03	5-Nov-2021	5-5.2	7.92	14,800	0.47	5.7	121	0.34	<5	0.222	41.4	13.7	31.6	28,800	5.79	12.6	503	0.0426	0.7	47.8	0.34	<0.1	56.5	0.081	<2	<0.5	0.753	55.3	70.4
SE-04	5-Nov-2021	4.78-4.98	7.93	21,600	0.74	7.1	189	0.49	<5	0.344	57	18.1	43.8	36,600	7.47	14.3	712	0.0625	1.02	65.7	0.53	0.14	76.9	0.134	<2	<0.5	0.848	72	92.2
SE-05	5-Nov-2021	4.62-4.82	7.86	12,500	0.32	4.38	94.9	0.25	<5	0.147	34.5	10.8	22.4	24,800	4.24	10.4	412	0.0276	0.49	38.2	<0.2	<0.1	45	0.061	<2	<0.5	0.546	54.8	58.6
SE-06	5-Nov-2021	4.48-4.68	7.54	13,500	0.38	4.67	101	0.27	<5	0.179	37.8	11.6	26.2	26,000	4.72	11.3	405	0.0335	0.57	40.6	<0.2	<0.1	49.8	0.071	<2	<0.5	0.64	56.3	63
SE-07	5-Nov-2021	4.2-4.4	7.66	10,400	0.26	3.42	71.6	0.2	<5	0.103	31.7	9.15	16.2	21,900	3.02	7.6	330	0.0218	0.36	32.5	<0.2	<0.1	36.7	<0.05	<2	<0.5	0.404	55.8	45
Z01 (Dup of SE-07)	5-Nov-2021	4.2-4.4	7.64	9590	0.26	3.53	64.7	0.18	<5	0.113	28.2	8.83	17	20,000	2.9	7.4	308	0.0206	0.4	31.2	<0.2	0.25	31.5	<0.05	<2	<0.5	0.427	45.3	46.8
SE-08	5-Nov-2021	2.4-2.6	7.02	12,000	0.37	4.44	86.6	0.22	<5	0.143	31.7	10.4	22.6	23,200	4.09	9.3	343	0.0327	0.48	35.6	0.21	<0.1	40.8	0.06	<2	<0.5	0.504	52	65.6
SE-09	5-Nov-2021	6.03-6.23	7.27	12,200	0.34	4.34	91	0.22	<5	0.187	30.5	10.3	23.1	22,700	4.42	9.6	380	0.0314	0.48	34	0.22	<0.1	41.1	0.071	<2	<0.5	0.548	52.9	56.5
SE-10	5-Nov-2021	6.39-6.59	6.29	9610	0.16	2.47	48.8	0.16	<5	0.108	17.2	7.29	14.6	16,500	2.01	7.3	342	0.0182	0.2	25.4	<0.2	<0.1	17.6	<0.05	<2	<0.5	0.223	40.4	44.9
SE-11	5-Nov-2021	2.95-3.15	7.07	12,800	0.38	5.16	88.6	0.25	<5	0.2	33.6	11.7	25.8	26,100	5.16	10.8	404	0.034	0.59	36.8	0.23	<0.1	39	0.069	<2	<0.5	0.646	56.6	65.7
SE-12	5-Nov-2021	2.02-2.22	7.66	16,700	0.51	6.31	128	0.35	<5	0.26	43	14.7	34.9	30,900	6.6	14.7	587	0.0479	0.76	49.6	0.32	0.11	57.1	0.09	<2	<0.5	0.759	59.7	78.2
Z02 (Dup of SE-12)	5-Nov-2021	2.02-2.22	7.23	17,500	0.57	6.31	120	0.34	<5	0.274	40.6	14.3	37.1	31,200	7.68	14.5	617	0.0492	0.84	44.5	0.43	<0.1	53.4	0.085	<2	<0.5	0.869	62	85.1
SE-13	5-Nov-2021	3.24-3.44	7.46	14,000	0.36	4.65	102	0.26	<5	0.187	35.6	11.4	25.3	25,400	5.07	11.2	410	0.0368	0.55	39	<0.2	<0.1	47.8	0.068	<2	<0.5	0.635	53.2	68.6
SE-14	5-Nov-2021	0.54-0.74	7.79	18,500	0.59	6.83	141	0.39	<5	0.274	49.8	16	38.1	32,600	7.46	16	650	0.0542	0.86	57	0.47	0.12	64.6	0.097	<2	<0.5	0.812	61.8	79.8
SE-15	5-Nov-2021	3.59-3.79	7.3	16,100	0.45	5.56	116	0.35	<5	0.253	42.4	13.5	32.5	29,300	5.95	13.1	459	0.0409	0.83	47.3	0.3	<0.1	55.4	0.083	<2	<0.5	0.816	59.1	77.4
SE-16	5-Nov-2021	3.15-3.35	7.39	16,700	0.55	6.03	122	0.34	<5	0.233	42.6	14	33	31,000	6.24	14.1	530	0.0421	0.69	47.5	0.33	0.12	57.4	0.086	<2	<0.5	0.807	59.5	79.4

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Standard Table Notes
Groundwater Samples

Groundwater sample results are presented as µg/l (ppb).

Shaded & Bold	Greater than the most stringent CSR Standard and CCME Guideline and above applicable regional background concentrations
Shaded & Bold	Greater than the most stringent CCME Guideline but below CSR Standard
Bold	Greater than the most stringent CSR Standard or CCME Guideline, but below applicable regional background concentrations
Bold	Detection limit greater than standard
*	Sample only exceeds the CCME Guideline, however the location is on the the freehold portion of the Site where federal guidelines do not apply.
-	not analyzed
~	no standard
<	Less than the stated detection limit
AW	aquatic life use
BH_M	monitoring well
CFC	Chlorofluorocarbons
CL	Commercial Land Use
CSR	Contaminated Sites Regulation (1997, and amendments)
DW	drinking water use
EPH C10-C19	Extractable Petroleum Hydrocarbons, not corrected for PAH
F2 (C10-C16)	petroleum hydrocarbon fraction 2
F3 (C16-C34)	petroleum hydrocarbon fraction 3
F4 (C34-C50)	petroleum hydrocarbon fraction 4
FIGW	Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (2010 and revisions)
HEPH	Heavy Extractable Petroleum Hydrocarbons, corrected for PAH
IL	Industrial Land Use
LEPH	Light Extractable Petroleum Hydrocarbons, corrected for PAH
MAH	monocyclic aromatic hydrocarbons (benzene, ethylbenzene, toluene and xylenes)
MTBE	methyl tert-butyl ether
NGR	no guideline required
PAH	polycyclic aromatic hydrocarbons
RDL	reportable detection limit
VH C6-C10	Volatile Hydrocarbons
VOC	Volatile Organic Compounds
VPH C6-C10	Volatile Petroleum Hydrocarbons excluding benzene, ethylbenzene, toluene and xylenes
Z	field replicate/duplicate Sample
1	Result is for dissolved chromium and the standard shown is the more stringent of either the chromium VI or chromium III standard
2	The standard is hardness dependent and the sample specific standard has been applied
3	The standard is chloride dependent. Where chloride data is not available, the most stringent standard has been applied.
4	The standard is pH dependent and the sample specific standard has been applied
5	Standard varies with pH, temperature and substance isomer.

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Standard Table Notes
Groundwater Samples

Parameter	CSR Sch 3.2 AW Freshwater Hardness Dependent Standards
Cadmium	0.5 @ H <30 1.5 @ H = 30 - <90 2.5 @ H = 90 - <150 3.5 @ H = 150 - <210 4 @ H >210
Copper	20 @ H <50 30 @ H = 50 - <75 40 @ H = 75 - <100 50 @ H = 100 - <125 60 @ H = 125 - <150 70 @ H = 150 - <175 80 @ H = 175 - <200 90 @ H >=200
Fluoride	2 000 @ H <50 3 000@ H >=50
Lead	40 @ H <50 50 @ H = 50 - <100 60 @ H = 100 - <200 110 @ H = 200 - <300 160 @ H >=300
Nickel	250 @ H <60 650 @ H = 60 - <120 1 100 @ H = 120 - <180 1 500 @ H >=180
Silver	0.5 @ H <=100 15 @ H >100
Zinc	75 @ H <90 150 @ H = 90 - <100 900 @ H = 100 - <200 1 650 @ H = 200 - <300 2 400 @ H = 300 - <400 use formula @H >400
Parameter	CSR Sch 3.2 AW Hardness Dependent Standards
Sulfate	1 280 000 @ H <=30 2 180 000 @ H = 31 - 75 3 090 000 @ H = 76 - 180 4 290 000 @ H > 180
Parameter	CSR Sch 3.2 AW Chloride (Cl) Dependent Standards (ug/L)
Nitrite (as N)	200 @ Cl < 2 mg/L 400 @ Cl 2 - <4 mg/L 600 @ Cl 4 - <6 mg/L 800 @ Cl 6 - <8 mg/L 1 000 @ Cl 8 - < 10 mg/L 2 000 @ Cl >= 10 mg/L
Parameter	CSR Sch 3.2 AW Freshwater pH Dependent Standards (ug/L)
Ammonia, total (as N)	1 310 @ pH >=8.5 3 700 @ pH 8.0 - <8.5 11 300 @ pH 7.5 - <8.0 18 500 @ pH 7.0 - <7.5 18 400 @ pH <7.0

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Table 9
Groundwater Results - Petroleum Hydrocarbons
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	MAH				Fuel Parameters		Petroleum Hydrocarbons									PAH																				
	benzene	toluene	ethylbenzene	xylenes, total	methyl tert-butyl ether [MTBE]	dichloroethane, 1,2-	VH (C6-C10)	VPH	EPH (C10-C19)	EPH (C19-C32)	LEPH	HEPH	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)	methylnaphthalene, 1-	methylnaphthalene, 2-	acenaphthene	acenaphthylene	acridine	anthracene	benz(a)anthracene	benzo(a)pyrene	benzo(ghi)perylene	benzo(b+j)fluoranthene	benzo(k)fluoranthene	chrysene	dibenz(a,h)anthracene	fluoranthene	fluorene	indeno(1,2,3-cd)pyrene	naphthalene	phenanthrene	pyrene	quinoline
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RDL	0.5	0.4	0.5	0.5	0.5	0.5	100	100	250	250	250	250	100	250	250	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.05	0.02	0.01	0.05
CSR Sch 3.2 AW (Freshwater)	**400**	**5**	**2000**	**300**	**34000**	**1000**	**15000**	**1500**	**5000**	**~**	**500**	**~**	**~**	**~**	**~**	**~**	**~**	**60**	**~**	**0.5**	**1**	**1**	**0.1**	**~**	**~**	**~**	**1**	**~**	**2**	**120**	**~**	**10**	**3**	**0.2**	**34**
CSR Sch 3.2 DW	**5**	**60**	**140**	**90**	**95**	**5**	**15000**		**5000**	**~**	**~**	**~**	**~**	**~**	**~**	**5.5**	**15**	**250**	**~**	**~**	**1000**	**0.07**	**0.01**	**~**	**0.07**	**~**	**7**	**0.01**	**150**	**150**	**~**	**80**	**~**	**100**	**0.05**
FIGW -Tier 2 CL / IL, Coarse Soil	**690**	**83**	**41,000**	**18000**	**10,000**	**100**	**~**	**~**	**~**	**~**	**~**	**~**	**1300**	**~**	**~**	**180**	**180**	**5.8**	**46**	**0.05**	**0.012**	**0.018**	**0.015**	**0.17**	**0.48**	**0.48**	**1.4**	**0.26**	**0.04**	**3**	**0.21**	**1.1**	**0.4**	**0.025**	**3.4**
FIGW - CL / IL, Fine Soil	**33,000**	**240000**	**150000**	**74000**	**10,000**	**100**	**~**	**~**	**~**	**~**	**~**	**~**	**3100**	**~**	**~**	**180**	**180**	**5.8**	**46**	**0.05**	**0.012**	**0.018**	**0.017**	**0.21**	**0.48**	**0.48**	**1.4**	**0.28**	**0.04**	**3**	**0.23**	**1.1**	**0.4**	**0.025**	**3.4**
Location	**Date**																																		
BH01M	28-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	0.914	1.1	1.2	0.028	0.016	**<0.06**	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	0.042	0.558	<0.01	8.37	0.443	0.023	<0.05
BH02M	27-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.05	<0.02	<0.01	<0.05
BH03M	27-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	<0.01	<0.01	<0.03	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.05	<0.02	<0.01	<0.05
BH04M	27-Sep-21	-	-	-	-	-	-	-	-	<250	690	<250	690	-	-	-	0.015	0.013	<0.02	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.052	<0.02	0.019	<0.05
BH05M	27-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.05	<0.02	<0.01	<0.05
Z03 (Dup of BH05M)	27-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.05	<0.02	<0.01	<0.05
BH06M	27-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.05	<0.02	<0.01	<0.05
BH07M	22-Sep-21	<0.5	0.45	<0.5	0.5	<0.5	<0.5	<100	<100	<250	<250	<250	<250	-	-	-	<0.01	0.015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.086	<0.02	<0.01	<0.05
BH08M	22-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	<0.01	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.121	<0.02	<0.01	<0.05
BH09M	22-Sep-21	<0.5	<0.4	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250	<250	-	-	-	<0.01	0.018	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.117	<0.02	<0.01	<0.05
Z01 (Dup of BH09M)	22-Sep-21	<0.5	<0.4	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250	<250	-	-	-	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.07	<0.02	<0.01	<0.05
BH10M	22-Sep-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	-	-	-	0.024	0.043	0.014	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	0.02	<0.01	0.206	<0.02	<0.01	<0.05
BH11M	10-Nov-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	<100	<250	<250	<0.01	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.075	<0.02	<0.01	<0.05
BH14M	8-Nov-21	-	-	-	-	-	-	-	-	<250	<250	<250	<250	<100	<250	<250	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.08	<0.02	<0.01	<0.05
BH15M	8-Nov-21	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250	<250	<100	280	<250	0.022	0.022	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	0.012	<0.01	0.073	0.026	0.015	<0.05
Z01 (Dup of BH15M)	8-Nov-21	<0.5	0.51	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250	<250	<100	<250	<250	0.021	0.022	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	0.011	<0.01	0.066	0.026	0.016	<0.05

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Table 10
Groundwater Results - Volatile Organic Compounds
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	Brominated Aliphatics			Chlorinated Aliphatics																				Chlorinated Benzenes				CFC
	bromodichloromethane (BDCM)	bromoform	dibromochloromethane (DBCM)	carbon tetrachloride	chloroethane	chloroform	chloromethane	dichloroethane, 1,1-	dichloroethylene, 1,1-	dichloroethylene, 1,2-cis-	dichloroethylene, 1,2-trans-	dichloromethane	dichloropropane, 1,2-	dichloropropene, 1,3- (cis + trans)	dichloropropene, 1,3- (cis)	dichloropropene, 1,3- (trans)	tetrachloroethane, 1,1,1,2-	tetrachloroethane, 1,1,2,2-	tetrachloroethylene	trichloroethane, 1,1,1-	trichloroethane, 1,1,2-	trichloroethylene	vinyl chloride	chlorobenzene	dichlorobenzene, 1,2-	dichlorobenzene, 1,3-	dichlorobenzene, 1,4-	trichlorofluoromethane (CFC-11)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RDL	0.5	0.5	0.5	0.5	0.5	0.5	5	0.5	0.5	0.5	0.5	1	0.5	0.75	0.5	0.5	0.5	0.2	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5
CSR Sch 3.2 AW (Freshwater)	~	~	~	**130**	~	**20**	~	~	~	~	~	**980**	~	~	~	~	~	~	**1100**	~	~	**200**	~	**13**	**7**	**1500**	**260**	~
CSR Sch 3.2 DW	**100**	**100**	**100**	**2**	~	**100**	~	**30**	**14**	**8**	**80**	**50**	**4.5**	**1.5**	~	~	**6**	**0.8**	**30**	**8000**	**3**	**5**	**2**	**80**	**200**	~	**5**	**1000**
FIGW - CL / IL, Coarse Soil	**8500**	**3700**	**10000**	**13**	~	**1.8**	~	**260,000**	**490**	**30**	**30**	**98**	**720**	**310**	~	~	**2500**	**3000**	**110**	**1100**	**1200**	**29**	**13**	**1.3**	**0.7**	**150**	**26**	~
FIGW - CL / IL, Fine Soil	**8500**	**3700**	**250000**	**13**	~	**1.8**	~	**260,000**	**4500**	**230**	**230**	**98**	**720**	**310**	~	~	**2500**	**3000**	**110**	**1100**	**1200**	**270**	**120**	**1.3**	**0.7**	**150**	**26**	~
Location	**Date**																											
BH07M	22-Sep-21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.75	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.4	<0.5	<0.5	<0.5	<0.5	<0.5
BH09M	22-Sep-21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.75	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.4	<0.5	<0.5	<0.5	<0.5	<0.5
Z01 (Dup of BH09M)	22-Sep-21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.75	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.4	<0.5	<0.5	<0.5	<0.5	<0.5
BH15M	8-Nov-21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.75	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.4	<0.5	<0.5	<0.5	<0.5	<0.5
Z01 (Dup of BH15M)	8-Nov-21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.75	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.4	<0.5	<0.5	<0.5	<0.5	<0.5

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Table 11
Groundwater Results - Dissolved Metals and Inorganics
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	Metals															
	hardness as CaCO3	pH (lab)	aluminium	antimony	arsenic	barium	boron	cadmium	chromium	cobalt	copper	iron	lead	magnesium	manganese
	mg/L	pH_Units	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	ug/L	ug/L	ug/L
RDL	0.5	0.1	1	0.1	0.1	0.1	10	0.005	0.5	0.1	0.2	10	0.05	5	0.1
CSR Sch 3.2 AW (Freshwater)	~	~	~	90	50	10000	12000	0.5-4[2]	10[1]	40	20-90[2]	~	40-160[2]	~	~
CSR Sch 3.2 DW	~	~	9500	6	10	1000	5000	5	50	1	1500	6500	10	~	1500
FIGW - CL / IL, Coarse Soil	~	6.5-9	5[2]	2	5	2900	~	0.017	8.9	~	2[2]	300	1[2]	~	~
FIGW - CL / IL, Fine Soil	~	6.5-9	5[2]	2000	5	2900	~	0.017	8.9	~	2[2]	300	1[2]	~	~
CSR Background P9 Regional GW - Lower Mainland Sub-Region 1	6300	~	330	1.6	38	490	820	0.97	12	62	14	290000	2.1	~	26000
Location	Date															
BH01M	28-Sep-21	389	7.42	14.6	0.23	8.99	227	46	0.0109	1.69	9.64	0.47	15,400	<0.05	27,700	3400
BH02M	27-Sep-21	530	7.63	9.7	0.42	2.96	291	113	0.0297	0.88	4.18	2.47	916	0.067	32,200	1960
BH03M	27-Sep-21	455	7.29	8.9	<0.2	7.49	225	47	0.0126	1.39	14.3	0.95	14,700	<0.1	30,500	5450
BH04M	27-Sep-21	115	8.13	370	2.42	10.1	84.5	115	0.0445	2.41	1.21	6.83	336	0.335	5130	246
BH05M	27-Sep-21	487	6.56	12.9	<0.2	110	438	122	0.0151	2.96	29.9	0.44	159,000	<0.1	40,600	5440
Z03 (Dup of BH05M)	27-Sep-21	496	6.58	11.4	<0.2	111	439	120	0.0218	2.79	29.9	1.36	165,000	<0.1	40,400	5560
BH05M	8-Nov-21	41.8	-	107	0.19	4.22	21.2	23	<0.01	<0.5	0.42	0.96	693	0.155	1660	242
BH05M	17-Nov-21	271	-	17	<0.1	69	225	71	<0.005	1.83	10.4	0.28	68,700	<0.05	17,600	5030
BH05M	18-Jan-22	-	-	-	-	153	-	-	-	-	-	-	-	-	-	-
BH06M	27-Sep-21	418	7.98	12.3	0.42	5.37	172	57	0.012	0.84	3.08	2.7	1710	0.119	31,900	1600
BH07M	22-Sep-21	278	7.17	14.1	0.27	9.81	155	46	0.0329	1.57	3.92	1.32	8870	<0.1	19,100	8350
BH08M	22-Sep-21	264	7.62	8.2	0.44	1.47	126	46	0.0118	1.11	2.85	2.62	1520	0.088	21,300	1890
BH09M	22-Sep-21	269	6.91	4.5	<0.1	1.79	213	53	<0.005	<0.5	4.12	<0.2	21,600	<0.05	24,700	1820
Z01 (Dup of BH09M)	22-Sep-21	266	7.05	4.9	<0.1	1.69	204	54	<0.005	<0.5	4.14	0.79	21,000	<0.05	24,700	1880
BH10M	22-Sep-21	429	6.71	9.8	0.13	1.28	213	72	0.0156	<0.5	10.3	1.32	35,600	0.083	45,700	3520
BH11M	10-Nov-21	445	-	10.9	0.16	1.64	324	87	0.0401	0.82	9.26	<0.2	28,600	<0.05	34,000	4150
BH12M	8-Nov-21	456	-	6.8	0.13	5.72	437	190	0.163	1.16	20.1	0.36	30,800	<0.05	27,800	3840
BH12M	17-Nov-21	463	-	11.6	<0.1	75.8	578	212	0.0292	2.78	35.3	<0.2	158,000	<0.05	26,300	3840
BH12M	18-Jan-22	-	-	-	-	45.1	-	-	-	-	-	-	-	-	-	-
BH13M	10-Nov-21	439	-	9.6	<0.1	85.8	521	172	0.032	2.48	40.2	<0.2	166,000	<0.05	27,700	4620
BH13M	17-Nov-21	423	-	11.3	<0.1	75.8	528	184	0.0233	2.57	38	<0.2	164,000	<0.05	25,200	4090
Z01 (Dup of BH13M)	17-Nov-21	427	-	10.7	<0.1	75.1	520	179	0.0208	2.56	37.6	<0.2	161,000	<0.05	24,900	4140
BH13M	18-Jan-22	-	-	-	-	58	-	-	-	-	-	-	-	-	-	-
BH14M	8-Nov-21	435	-	7.5	0.23	4.29	281	67	0.0823	0.62	8.09	2.21	7690	<0.05	29,200	4340
BH14M	17-Nov-21	442	-	15.4	<0.2	5.68	383	77	0.0226	<1	12.2	0.43	23,700	<0.1	29,000	8000
BH15M	8-Nov-21	266	7.63	6.4	0.48	3.01	139	80	0.0184	<0.5	1.21	2.9	1520	0.075	12,900	519
Z01 (Dup of BH15M)	8-Nov-21	264	7.4	7.9	0.46	3.1	142	76	0.0234	<0.5	1.23	0.47	1420	<0.05	13,300	514
BH16M	18-Jan-22	-	-	-	-	6.27	-	-	-	-	-	-	-	-	-	-
BH17M	18-Jan-22	-	-	-	-	4.62	-	-	-	-	-	-	-	-	-	-
BH18M	18-Jan-22	-	-	-	-	7.65	-	-	-	-	-	-	-	-	-	-
BH19M	18-Jan-22	-	-	-	-	1.47	-	-	-	-	-	-	-	-	-	-
BH20M	18-Jan-22	-	-	-	-	1.88	-	-	-	-	-	-	-	-	-	-
Z01 (Dup of BH20M)	18-Jan-22	-	-	-	-	2.02	-	-	-	-	-	-	-	-	-	-

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Table 11
Groundwater Results - Dissolved Metals and Inorganics
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

		Metals													Inorganics
		mercury	molybdenum	nickel	selenium	silver	sodium	strontium	thallium	tin	titanium	tungsten	uranium	zinc	Calcium
		µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	ug/L	ug/L
RDL		0.005	0.05	0.5	0.05	0.01	50	0.2	0.01	0.1	0.3	0.1	0.01	1	50
CSR Sch 3.2 AW (Freshwater)		0.25	10000	250-1500[2]	20	0.5-15[2]	~	~	3	~	1000	~	85	75-2400[2]	~
CSR Sch 3.2 DW		1	250	80	10	20	200000	2500	~	2500	~	3	20	3000	~
FIGW - CL / IL, Coarse Soil		0.026	73	25[2]	1	0.1	~	~	0.8	~	100	~	15	30	~
FIGW - CL / IL, Fine Soil		0.026	73	25[2]	1	0.1	~	~	0.8	~	100	~	15	30	~
CSR Background P9 Regional GW - Lower Mainland Sub-Region 1		0.49	9	110	4.4	0.2	900000	1300	0.33	~	110	~	11	44	~
Location	Date														
BH01M	28-Sep-21	<0.005	2.73	8.25	0.414	<0.01	37,900	578	<0.01	<0.1	0.69	<0.1	2.23	6.6	110,000
BH02M	27-Sep-21	<0.005	1.96	8.89	1.12	<0.02	46,600	669	0.035	<0.1	0.79	<0.1	6.83	8.7	159,000
BH03M	27-Sep-21	0.0216	2.76	11.9	0.384	<0.02	31,700	562	<0.02	<0.2	0.64	<0.2	1.85	5.2	132,000
BH04M	27-Sep-21	<0.005	28.2	7.45	3.33	<0.01	223,000	180	0.031	0.12	13.3	0.32	7.38	8	37,500
BH05M	27-Sep-21	<0.005	10.8	34.6	0.682	<0.02	48,200	1100	<0.02	<0.2	0.78	<0.2	0.147	5.2	128,000
Z03 (Dup of BH05M)	27-Sep-21	<0.005	11.2	34.2	1.57	<0.02	48,900	1130	0.022	<0.2	1	<0.2	0.137	10.1	132,000
BH05M	8-Nov-21	<0.005	7.97	1.59	0.256	<0.01	32,000	66.7	<0.01	<0.1	2.74	<0.1	0.042	7.6	14,000
BH05M	17-Nov-21	<0.005	6.06	10.3	0.476	<0.01	44,300	554	<0.01	<0.1	1.57	<0.1	0.06	2	-
BH05M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	3.8	-
BH06M	27-Sep-21	<0.005	5.67	6.53	1.25	<0.01	51,900	588	<0.01	<0.1	0.85	<0.1	4.55	10.1	115,000
BH07M	22-Sep-21	<0.005	10.3	6.8	0.223	<0.02	22,900	464	<0.02	<0.2	0.63	<0.2	1.22	9.3	79,900
BH08M	22-Sep-21	<0.005	3.68	4.58	0.646	<0.01	25,900	361	<0.01	<0.1	<0.6	<0.1	3.29	10.2	70,600
BH09M	22-Sep-21	<0.005	0.907	4.54	0.191	<0.01	48,000	265	<0.01	<0.1	<0.3	<0.1	0.369	3.4	67,000
Z01 (Dup of BH09M)	22-Sep-21	<0.005	0.925	4.67	0.16	<0.01	47,400	263	<0.01	<0.1	<0.3	<0.1	0.379	7	66,000
BH10M	22-Sep-21	<0.005	1.16	7.26	0.275	<0.01	24,400	416	<0.01	<0.1	0.42	<0.1	0.734	23.1	96,500
BH11M	10-Nov-21	<0.005	1.35	8.74	0.373	<0.01	50,200	609	0.034	<0.1	0.59	<0.1	1.54	6.2	-
BH12M	8-Nov-21	<0.005	1.22	16.9	0.679	<0.01	89,500	780	0.095	<0.1	0.42	<0.1	1.06	8.6	137,000
BH12M	17-Nov-21	<0.005	3.05	25.8	0.275	<0.01	85,900	905	0.032	0.1	0.96	<0.1	0.105	5	-
BH12M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH13M	10-Nov-21	<0.005	2.79	22.4	0.342	<0.01	88,400	837	0.032	<0.1	0.93	<0.1	0.089	3.8	130,000
BH13M	17-Nov-21	<0.005	2.91	20.4	0.285	<0.01	90,100	900	0.023	0.47	0.92	<0.1	0.236	3.8	-
Z01 (Dup of BH13M)	17-Nov-21	<0.005	2.8	20.2	0.324	<0.01	88,800	922	0.026	0.5	1.04	<0.1	0.316	3.6	-
BH13M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14M	8-Nov-21	<0.005	1.39	11.3	0.65	<0.01	93,400	559	0.025	<0.1	0.5	<0.1	2.16	200	-
BH14M	17-Nov-21	<0.005	1.16	14.4	0.237	<0.02	107,000	613	<0.02	<0.2	<0.9	<0.2	1.56	97.8	-
BH15M	8-Nov-21	<0.005	3.16	4.51	1.27	<0.01	57,200	341	0.021	<0.1	<0.3	<0.1	3.81	8.4	-
Z01 (Dup of BH15M)	8-Nov-21	<0.005	2.97	4.52	1.2	<0.01	57,500	343	0.022	<0.1	0.56	<0.1	3.78	4	-
BH16M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	8.6	
BH17M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	3.1	
BH18M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	4.1	
BH19M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	5	
BH20M	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	1.6	
Z01 (Dup of BH20M)	18-Jan-22	-	-	-	-	-	-	-	-	-	-	-	-	<1	

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Table 12
Groundwater Results - Glycols
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

		Glycols			
		ethylene glycol	triethylene glycol	diethylene glycol	propylene glycol
		µg/L	µg/L	µg/L	µg/L
RDL		5000	5000	5000	5000
CSR Sch 3.2 AW (Freshwater)		**1920000**	~	~	**5000000**
CSR Sch 3.2 DW		**8000**	**8000**	~	**80000**
FIGW - CL / IL, Coarse Soil		**190000**	~	~	**500000**
FIGW - CL / IL, Fine Soil		**190000**	~	~	**500000**
Location	**Date**				
BH07M	22-Sep-21	<5000	<5000	<5000	<5000
Z02 (Dup of BH07M)	22-Sep-21	<5000	<5000	<5000	<5000

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Table 13
Groundwater Results - Anions, Nutrients and Sulphides
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	Anions		Ions		Nitrogen Compounds				Sulphides	
	Bromide	Chloride (Filtered)	fluoride (F-)	sulphate (SO4 2-) (Filtered)	Field pH	ammonia, total (as N)	nitrate (as N)	nitrite (as N)	Hydrogen sulfide	Sulphide
	µg/L	µg/L	µg/L	µg/L	pH_units	µg/L	µg/L	µg/L	µg/L	µg/L
RDL	50	500	20	300		5	5	1	1.6	1.5
CSR Sch 3.2 AW (Freshwater)	**~**	**1500000**	**2000-3000[1]**	**1280000-4290000[1]**	**~**	**1310-18500[4]**	**400000**	**200-2000[3]**	**20**	**20**
CSR Sch 3.2 DW	**~**	**250000**	**1500**	**500000**	**~**	**~**	**10000**	**1000**	**50**	**50**
FIGW - CL / IL, Coarse Soil	**~**	**120000**	**120**	**100000**	**6.5-9**	**~**	**13000**	**60**	**2**	**~**
FIGW - CL / IL, Fine Soil	**~**	**120000**	**120**	**100000**	**6.5-9**	**~**	**13000**	**60**	**2**	**~**
Location	**Date**									
BH01M	28-Sep-21	320	36,000	<100	21,200	7.17	1980	<25	<5	7.1*	6.7
BH02M	27-Sep-21	698	69,500	123*	22,900	6.54	4490	<25	<5	8.1*	7.6
BH03M	27-Sep-21	296	26,200	215*	23,900	6.54	1700	<25	<5	2.4*	2.3
BH04M	27-Sep-21	<250	20,600	653*	107,000	6.57	114	<25	<5	9*	8.5
BH05M	27-Sep-21	982	133,000*	271*	4380	6.46	7340	<25	<5	**<8**	<7.5
Z03 (Dup of BH05M)	27-Sep-21	945	134,000*	273*	<1500	6.46	7200	<25	<5	**<8**	<7.5
BH06M	27-Sep-21	1180	18,100	153*	32,900	-	1190	<25	<5	16.6*	15.6
BH07M	22-Sep-21	182	19,900	556*	1340	6.64	2950	<5	<1	4.2*	4
BH08M	22-Sep-21	<50	8590	170*	4490	6.79	376	<5	<1	3.3*	3.1
BH09M	22-Sep-21	<250	76,400	<100	3090	6.52	759	<25	<5	7.8*	7.3
Z01 (Dup of BH09M)	22-Sep-21	<250	81,000	<100	1710	6.52	780	<25	<5	12.6*	11.8
BH10M	22-Sep-21	428	6490	<100	7470	6.4	417	<25	<5	6.2*	5.8

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Table 14
Grounwater Results - Phenols
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

	Non-Chorinated Phenols							Chlorinated Phenols																		
	methylphenol, 2-	Phenol	methylphenol, 4-	dimethylphenol, 2,4-	3-Methylphenol	4-chloro-3-methylphenol	Phenols (4AAP)	pentachlorophenol (PCP)	chlorophenol, 2-	chlorophenol, 3-	chlorophenol, 4-	dichlorophenol, 2,3-	dichlorophenol, 2,4- & 2,5-	dichlorophenol, 2,6-	dichlorophenol, 3,4-	dichlorophenol, 3,5-	trichlorophenol, 2,3,4-	trichlorophenol, 2,3,5-	trichlorophenol, 2,3,6-	trichlorophenol, 2,4,5-	trichlorophenol, 2,4,6-	trichlorophenol, 3,4,5-	tetrachlorophenol, 2,3,4,5-	tetrachlorophenol, 2,3,4,6-	tetrachlorophenol, 2,3,5,6-
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RDL	0.5	0.2	0.2	0.2	0.2	0.1	1	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CSR Sch 3.2 AW (Freshwater)	2500	2000	700	~	800	~	~	1-110[5]	19.5-2600[5]	17-2300[5]	8.5-1180[5]	5.5-760[5]	~	10-1360[5]	3-400[5]	2.5-300[5]	2.5-320[5]	2.5-340[5]	8-1080[5]	2.5-300[5]	6-800[5]	1-128[5]	2-260[5]	5.5-720[5]	2.5-340[5]
CSR Sch 3.2 DW	200	1000	400	80	200	400	~	60	45	~	~	~	~	~	~	~	~	~	~	400	5	~	~	100	~
FIGW - CL / IL, Coarse Soil	~	4	~	3900	~	~	~	0.5	330	~	~	~	~	~	~	~	~	~	~	160	18	~	~	1	~
FIGW - CL / IL, Fine Soil	~	4	~	3900	~	~	~	0.5	330	~	~	~	~	~	~	~	~	~	~	160	18	~	~	1	~
Location	Date																									
BH01M	28-Sep-21	1.24	99.1	37.8	0.79	-	<0.1	121	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH02M	27-Sep-21	-	-	-	-	-	<0.1	2.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.06	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH03M	27-Sep-21	<0.50	4.84	1.56	0.42	-	<0.1	7.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH04M	27-Sep-21	0.68	1.62	2.04	<0.20	-	<0.1	18.2	<0.1	<0.05	<0.05	<0.05	<0.05	<0.1	<0.06	<0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH05M	27-Sep-21	-	-	-	-	-	<0.1	<1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Z03 (Dup of BH05M)	27-Sep-21	-	-	-	-	-	<0.1	<1	<0.1	<0.05	<0.05	<0.05	<0.05	0.055	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH06M	27-Sep-21	-	-	-	-	-	<0.1	2.4	<0.1	<0.05	<0.05	<0.05	<0.05	0.064	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH07M	22-Sep-21	-	-	-	-	-	<0.1	<1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH08M	22-Sep-21	-	-	-	-	-	<0.1	<1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH09M	22-Sep-21	-	-	-	-	-	<0.1	<1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Z01 (Dup of BH09M)	22-Sep-21	-	-	-	-	-	<0.1	<1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10M	22-Sep-21	-	-	-	-	-	<0.1	1.2	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH11M	10-Nov-21	<0.5	<0.2	<0.3	<0.2	<0.3	<0.1	-	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH14M	8-Nov-21	<0.5	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH15M	8-Nov-21	<0.5	<0.2	<0.2	<0.2	<0.2	<0.1	-	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Z01 (Dup of BH15M)	8-Nov-21	<0.5	<0.2	<0.2	<0.2	<0.2	<0.1	-	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

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Pottinger Gaherty Environmental Consultants
Standard Table Notes
Soil-vapour

Soil Vapour results are presented as µg/m³

Shaded & Bold	Greater than the most stringent CSR Standard after attenuation factor applied
Shaded & Bold	Greater than the most stringent CSR Standard before attenuation factor applied
Bold	Detection limit greater than standard
~	no standard or factor
<	Less than the stated detection limit
CFC	Chlorinated Fluorocarbons
CSR	Contaminated Sites Regulation (1997 and amendments)
IL	industrial use
MAH	monocyclic aromatic hydrocarbons (benzene, ethylbenzene, toluene and xylenes)
PAH	polycyclic aromatic hydrocarbons
RDL	reportable detection limit
SV__	soil vapour well or probe
VHv	Volatile Hydrocarbons (C6-C13)
VOC	Volatile Organic Compounds
VPHv	Volatile Petroleum Hydrocarbons (C6-C13) excluding benzene, ethylbenzene, toluene and xylenes
Z	field duplicate sample

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Table 15
Soil Vapour Results - Petroleum Hydrocarbons
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

					MAH							PAH
					benzene	ethylbenzene	toluene	styrene	xylenes, total	VHv	VPHv	naphthalene
					µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	ug/m3	ug/m3	µg/m3
RDL					1.5	5	40	5	12	1000	1000	3
CSR Sch 3.3 IL					**10**	**9000**	**45000**	**9000**	**900**	**~**	**11500**	**25**
Location	**Date**	**Seal Depth (m)**	**Attenuation Factor Type**	**Factor**								
SV1 (nested with BH04M)	4-Oct-21	1.3	Unattenuated	-	<9	38	<40	<5	260	84000	29200	<3
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.00333	0.01406	<0.0148	<0.00185	0.0962	31.08	29.304	<0.00111
			Outdoor Exposure	0.0000015	<0.0000135	0.000057	<0.00006	<0.0000075	0.00039	0.126	0.1188	<0.0000045
			Subslab	0.02	<0.18	0.76	<0.8	<0.1	5.2	1680	1584	<0.06
SV2 (nested with BH07M)	4-Oct-21	1.1	Unattenuated	-	9.6	14.2	90	7	71	5600	4700	10.8
			Indoor Exposure - Commercial / Industrial use	0.00037	0.003552	0.005254	0.0333	0.00259	0.02627	2.072	1.739	0.003996
			Outdoor Exposure	0.0000015	0.0000144	0.0000213	0.000135	0.0000105	0.0001065	0.0084	0.00705	0.0000162
			Subslab	0.02	0.192	0.284	1.8	0.14	1.42	112	94	0.216
Z01 (Dup of SV2)	4-Oct-21	1.1	Unattenuated	-	9	13	76	6.4	65	5700	4900	11
			Indoor Exposure - Commercial / Industrial use	0.00037	0.00333	0.00481	0.02812	0.002368	0.02405	2.109	1.813	0.00407
			Outdoor Exposure	0.0000015	0.0000135	0.0000195	0.000114	0.0000096	0.0000975	0.00855	0.00735	0.0000165
			Subslab	0.02	0.18	0.26	1.52	0.128	1.3	114	98	0.22
SV3 (nested with BH09M)	4-Oct-21	1.1	Unattenuated	-	2.7	6.8	46	<5	37	1600	1300	8.2
			Indoor Exposure - Commercial / Industrial use	0.00037	0.000999	0.002516	0.01702	<0.00185	0.01369	0.592	0.481	0.003034
			Outdoor Exposure	0.0000015	0.00000405	0.0000102	0.000069	<0.0000075	0.0000555	0.0024	0.00195	0.0000123
			Subslab	0.02	0.054	0.136	0.92	<0.1	0.74	32	26	0.164

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Table 15
Soil Vapour Results - Petroleum Hydrocarbons
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

					Fuel Parameters									
					MTBE	butadiene, 1,3-	n-decane	dibromoethane, 1,2-	dichloroethane, 1,2-	n-hexane_	Isopropylbenzene	methylcyclohexane	trimethylbenzene, 1,2,4-	trimethylbenzene, 1,3,5-
					ug/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3
RDL					50	3	50	0.4	0.4	50	5	50	6	2
CSR Sch 3.3 IL					**25000**	**3**	**25000**	**0.5**	**65**	**6500**	**3500**	**35000**	**65**	**65**
Location	**Date**	**Seal Depth (m)**	**Attenuation Factor Type**	**Factor**										
SV1 (nested with BH04M)	4-Oct-21	1.3	Unattenuated	-	<50	<25	<50	<2.4	-	4400	<5	4000	55.8	23.8
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.0185	<0.00925	<0.0185	<0.000888	-	1.628	<0.00185	1.48	0.020646	0.008806
			Outdoor Exposure	0.0000015	<0.000075	<0.0000375	<0.000075	<0.0000036	-	0.0066	<0.0000075	0.006	0.0000837	0.0000357
			Subslab	0.02	<1	<0.5	<1	<0.048	-	88	<0.1	80	1.116	0.476
SV2 (nested with BH07M)	4-Oct-21	1.1	Unattenuated	-	-	<5	<50	<2.8	<0.4	706	<5	286	33.8	10
			Indoor Exposure - Commercial / Industrial use	0.00037	-	<0.00185	<0.0185	<0.001036	<0.000148	0.26122	<0.00185	0.10582	0.012506	0.0037
			Outdoor Exposure	0.0000015	-	<0.0000075	<0.000075	<0.0000042	<0.0000006	0.001059	<0.0000075	0.000429	0.0000507	0.000015
			Subslab	0.02	-	<0.1	<1	<0.056	<0.008	14.12	<0.1	5.72	0.676	0.2
Z01 (Dup of SV2)	4-Oct-21	1.1	Unattenuated	-	-	<5	<50	<2.8	<0.4	700	<5	284	32	9.4
			Indoor Exposure - Commercial / Industrial use	0.00037	-	<0.00185	<0.0185	<0.001036	<0.000148	0.259	<0.00185	0.10508	0.01184	0.003478
			Outdoor Exposure	0.0000015	-	<0.0000075	<0.000075	<0.0000042	<0.0000006	0.00105	<0.0000075	0.000426	0.000048	0.0000141
			Subslab	0.02	-	<0.1	<1	<0.056	<0.008	14	<0.1	5.68	0.64	0.188
SV3 (nested with BH09M)	4-Oct-21	1.1	Unattenuated	-	<50	<3	<50	<0.4	-	184	<5	<50	20	5.8
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.0185	<0.00111	<0.0185	<0.000148	-	0.06808	<0.00185	<0.0185	0.0074	0.002146
			Outdoor Exposure	0.0000015	<0.000075	<0.0000045	<0.000075	<0.0000006	-	0.000276	<0.0000075	<0.000075	0.00003	0.0000087
			Subslab	0.02	<1	<0.06	<1	<0.008	-	3.68	<0.1	<1	0.4	0.116

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Table 16
Soil Vapour Results - Volatile Organic Compounds
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

					Brominated Aliphatics			Chlorinated Aliphatics										
					bromodichloromethane (bdcm)	bromoform	dibromochloromethane (dbcm)	carbon tetrachloride	chloroethane	dichloroethane, 1,1-	dichloroethylene, 1,1-	dichloroethylene, 1,2-cis-	dichloroethylene, 1,2-trans-	dichloropropane, 1,2-	dichloropropene, 1,3- (cis + trans)	dichloropropene, 1,3- (cis)	dichloropropene, 1,3- (trans)
					µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3
RDL					1.6	6	20	0.4	100	5	0.5	10	10	0.5	2.2	1	2
CSR Sch 3.3 IL					**800**	**85**	**800**	**15**	**90000**	**4500**	**2000**	**550**	**550**	**35**	**25**	**~**	**~**
Location	**Date**	**Seal Depth (m)**	**Attenuation Factor Type**	**Factor**													
SV2 (nested with BH07M)	4-Oct-21	1.1	Unattenuated	-	<1.6	<6	<20	<0.4	<100	<5	<0.5	<10	<10	<0.5	<2.2	<1	<2
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.000592	<0.00222	<0.0074	<0.000148	<0.037	<0.00185	<0.000185	<0.0037	<0.0037	<0.000185	<0.000814	<0.00037	<0.00074
			Outdoor Exposure	0.0000015	<0.0000024	<0.000009	<0.00003	<0.0000006	<0.00015	<0.0000075	<0.00000075	<0.000015	<0.000015	<0.00000075	<0.0000033	<0.0000015	<0.000003
			Subslab	0.02	<0.032	<0.12	<0.4	<0.008	<2	<0.1	<0.01	<0.2	<0.2	<0.01	<0.044	<0.02	<0.04
Z01 (Dup of SV2)	4-Oct-21	1.1	Unattenuated	-	<1.6	<6	<20	<0.4	<100	<5	<0.5	<10	<10	<0.5	<2.2	<1	<2
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.000592	<0.00222	<0.0074	<0.000148	<0.037	<0.00185	<0.000185	<0.0037	<0.0037	<0.000185	<0.000814	<0.00037	<0.00074
			Outdoor Exposure	0.0000015	<0.0000024	<0.000009	<0.00003	<0.0000006	<0.00015	<0.0000075	<0.00000075	<0.000015	<0.000015	<0.00000075	<0.0000033	<0.0000015	<0.000003
			Subslab	0.02	<0.032	<0.12	<0.4	<0.008	<2	<0.1	<0.01	<0.2	<0.2	<0.01	<0.044	<0.02	<0.04

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Table 16
Soil Vapour Results - Volatile Organic Compounds
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

				Chlorinated Aliphatics							Chlorinated Benzenes				CFC	
				tetrachloroethane, 1,1,1,2-	tetrachloroethane, 1,1,2,2-	tetrachloroethylene	trichloroethane, 1,1,1-	trichloroethane, 1,1,2-	trichloroethylene	vinyl chloride	chlorobenzene	dichlorobenzene, 1,2-	dichlorobenzene, 1,3-	dichlorobenzene, 1,4-	trichloro-1,2,2-trifluoroethane, 1,1,2- (cfc-113)	trichlorofluoromethane (cfc-11)
				µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3
RDL				1	0.6	20	5	4	0.4	1	5	30	10	10	50	50
CSR Sch 3.3 IL				**10**	**800**	**350**	**45000**	**2**	**20**	**10**	**90**	**2000**	**1000**	**7500**	**250000**	**6500**
Location	**Date**	**Seal Depth (m)**	**Attenuation Factor Type**	**Factor**												
SV2 (nested with BH07M)	4-Oct-21	1.1	Unattenuated	-	<1	<0.6	<20	<5	<4	<0.4	<1	<5	<30	<10	<10	<50	<50
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.00037	<0.000222	<0.0074	<0.00185	<0.00148	<0.000148	<0.00037	<0.00185	<0.0111	<0.0037	<0.0037	<0.0185	<0.0185
			Outdoor Exposure	0.0000015	<0.0000015	<0.0000009	<0.00003	<0.0000075	<0.000006	<0.0000006	<0.0000015	<0.0000075	<0.000045	<0.000015	<0.000015	<0.000075	<0.000075
			Subslab	0.02	<0.02	<0.012	<0.4	<0.1	<0.08	<0.008	<0.02	<0.1	<0.6	<0.2	<0.2	<1	<1
Z01 (Dup of SV2)	4-Oct-21	1.1	Unattenuated	-	<1	<0.6	<20	<5	<4	<0.4	<1	<5	<30	<10	<10	<50	<50
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.00037	<0.000222	<0.0074	<0.00185	<0.00148	<0.000148	<0.00037	<0.00185	<0.0111	<0.0037	<0.0037	<0.0185	<0.0185
			Outdoor Exposure	0.0000015	<0.0000015	<0.0000009	<0.00003	<0.0000075	<0.000006	<0.0000006	<0.0000015	<0.0000075	<0.000045	<0.000015	<0.000015	<0.000075	<0.000075
			Subslab	0.02	<0.02	<0.012	<0.4	<0.1	<0.08	<0.008	<0.02	<0.1	<0.6	<0.2	<0.2	<1	<1

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Table 17
Soil Vapour Results - Esters and Ketones
1950 Brigantine Drive, Coquitlam, BC
Peter Kiewit Sons - ULC, PGL File 3014-41.01

				Esters	Ketones		
				ethyl acetate	acetone	methyl ethyl ketone (mek)	methyl isobutyl ketone (mibk)
				µg/m3	µg/m3	µg/m3	µg/m3
RDL				40	20	50	50
CSR Sch 3.3 IL				**650**	**35000**	**45000**	**25000**
Location	**Date**	**Seal Depth (m)**	**Attenuation Factor Type**	**Factor**			
SV1 (nested with BH04M)	04-Oct-21	1.3	Unattenuated	-	-	-	-	<50
			Indoor Exposure - Commercial / Industrial use	0.00037	-	-	-	<0.0185
			Outdoor Exposure	0.0000015	-	-	-	<0.000075
			Subslab	0.02	-	-	-	<1
SV2 (nested with BH07M)	04-Oct-21	1.1	Unattenuated	-	<40	44	<50	-
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.0148	0.01628	<0.0185	-
			Outdoor Exposure	0.0000015	<0.00006	0.000066	<0.000075	-
			Subslab	0.02	<0.8	0.88	<1	-
Z01 (Dup of SV2)	04-Oct-21	1.1	Unattenuated	-	<40	38	<50	-
			Indoor Exposure - Commercial / Industrial use	0.00037	<0.0148	0.01406	<0.0185	-
			Outdoor Exposure	0.0000015	<0.00006	0.000057	<0.000075	-
			Subslab	0.02	<0.8	0.76	<1	-
SV3 (nested with BH09M)	04-Oct-21	1.1	Unattenuated	-	-	-	-	<50
			Indoor Exposure - Commercial / Industrial use	0.00037	-	-	-	<0.0185
			Outdoor Exposure	0.0000015	-	-	-	<0.000075
			Subslab	0.02	-	-	-	<1

Appendix A2

Benthic Debris Assessment

PGL ENVIRONMENTAL CONSULTANTS
1500 - 1185 West Georgia Street
Vancouver, BC V6E 4E6
604 682 3707
pggroup.com

May 13, 2022
PGL File: 3041-41.01

Peter Kiewit Sons ULC
310-4350 Still Creek Drive
Burnaby, BC
V5C 0G5

Attention: **Mathew Casola**
Design Engineering Manager

RE: BENTHIC DEBRIS ASSESSMENT, 1950 BRIGANTINE DRIVE, COQUITLAM, BC

PGL Environmental Consultants (PGL) was retained by Peter Kiewit Sons ULC (Kiewit) to conduct a benthic debris assessment of the water lot fronting 1950 Brigantine Drive, Coquitlam, BC (the Site; Figure 1). The Site is portioned into freehold and leased parcel which includes the water lots. The lease hold and water lots are owned by the Vancouver Fraser Port Authority (VFPA). The Site has been occupied by Pacific Custom Log Sorting Ltd since the 1990s. Kiewit recently purchased the freehold portion of the Site from Pacific Custom Log Sorting Ltd and is assuming the lease obligations for the VFPA parcels.

The objective for the benthic debris assessment is to demonstrate the river-bed conditions in the water lot at the conclusion of the log sort operational use. This letter provides an overview of the benthic debris survey approach and findings. This benthic debris assessment is a condition for lease exit for the VFPA.

PGL conducted assessment on January 13, 2022, using side sonar and drop camera techniques to survey the benthic environment for suspected anthropogenic debris that may be harmful to aquatic life.

1.0 BACKGROUND

The Site is on the north shore of the Fraser River approximately 1.8 km west (downstream) of the Port Mann Bridge. The Site is comprised of one legal lot (freehold) and the adjacent VFPA leased lands to the south, which include the water lot portion of the Site. The terrestrial portion of the Site was formerly occupied by a log sorting facility, which ceased operations in December 2021. The terrestrial portion of the Site is now largely vacant. The water lot fronting the Site was historically used for log boom storage and dock access. Limited tugboat operations and log boom storage use continue on the far eastern portion of the water lots.

Previous assessment of the water lot lease was done to support maintenance dredging, most recently in 2016. A report "Sediment Assessment Report: Pacific Custom Log Sorting Ltd, Coquitlam, British Columbia" was prepared by Balanced Environmental in October 2016. This report was completed for work within the water lot of the Site. The investigation was completed to obtain a renewable Disposal at Sea permit to allow maintenance dredging of up to 4,000m3 of material from PCSL water lot, annually, over a five-year period.

Six composite sediment samples were collected using an excavator from a spud barge. Sediment material primarily consisted of sand and silt. The samples were analyzed for metals (cadmium, mercury, arsenic, chromium, copper, lead, zinc), total polycyclic aromatic hydrocarbons (PAHs), total polychlorinated biphenyls, total organic carbon, and particle size. Copper levels in five sediment samples were non-compliant with Disposal at Sea Minimal Sample Analytical Requirements. All other analytical results were within the Disposal at Sea guidelines. All results did meet the applicable CSR standards and CCME sediment quality guidelines. Balanced Environmental concluded that a portion of the material to be dredged was suitable for Disposal at Sea and the rest was to be determined through further consultation with Environment Canada.

The VFPA requires an environmental baseline and exit assessment is completed at the end of a lease agreement in cases where on-Site activities may have altered environmental conditions during the term of the lease (Port of Vancouver, 2016). Based on conversations with Kate Schendel with the VFPA, a benthic debris assessment is required for this Site. We understand that the intent of the benthic debris survey is to provide the baseline information necessary for the VFPA to determine if further debris clean-up and removal is required.

2.0 APPROACH

Based on communications with the VFPA, we understand that guidelines for conducting benthic debris assessments are not available at this time. In the absence of prescriptive guidelines, we have employed two methods for visualizing the subsurface condition and identifying suspected debris: (1) a high frequency side scan sonar survey of the water lot, and (2) still photographs with an underwater drop camera at select locations.

The field assessment was conducted on January 13, 2022, between 10:00 am and 2:30 pm.

2.1 Side Scan Sonar Survey

A YellowFin high resolution sidescan sonar (Imagenex Model 872) was used to acquire sonar imagery. The field crew consisted of a boat operator, two field assistants, and a sonar technician. The sonar transducer (towfish) was positioned on the port side of the boat using a winch mount. This configuration permitted us to regulate the depth of the transducer to accommodate variable river depths and avoid potential snags. The towfish was connected to a topside computer processer and Garmin GPS antennas. The GPS unit was located on the boat, which was a variable distance from the towfish; results therefore indicate the presence and general location of suspected debris rather than an accurate location.

The side beam scan distance was set to 20 m per side, for a total scan swath of 40 m. In areas with poor boat accessibility due to log booms or barges, the side beam scan distance was increased to 100 m to scan under navigation barriers. The survey was conducted by systematically scanning the water lot along transects orientated parallel to the shore in an upstream (east) to downstream (west) direction at a constant speed of approximately three knots. Transects were overlapped by approximately 10 m to reduce blind spots in the scan imagery and avoid introducing gaps in the imagery. The sonar technician reviewed imagery in the field and adjusted the sonar depth, transect orientation, and image gain throughout the survey.

The raw sonar data was imported into SonarWiz software and transformed into georeferenced tracks for processing and analysis. Each transect was reviewed in full for suspected benthic debris. The following criteria was used to select suspected debris:

- One or more object(s) are clearly discernible and can be readily identified through visual interpretation;
- The object(s) appear to have originated from human-related activities. Rocks or boulders were not included; and
- Single logs were not included. In cases where low density, scattered logs were observed, professional judgement was used to determine whether they warranted inclusion as suspected debris.

A still image and location for suspected debris that met the above criteria were captured.

2.2 Drop Camera Imagery

To complement the side scan sonar survey, underwater images of the river bottom were obtained using an underwater camera affixed to a sonar grab sampler on the bow of the boat. Photographs were taken at three locations distributed throughout the water lot (Figure 1). Owing to turbid conditions in the Fraser River, the benthic environment and potential debris were not discernible in the imagery. This method was therefore not pursued further; example imagery is provided in Appendix A.

3.0 FINDINGS

The easternmost portion of the water lot was comprised of numerous log booms, a dock used for boat moorage, and a barge (Appendix A, photograph 1-2). The central and western portion of the water lot were largely unoccupied with numerous wooden and metal pilings present throughout (Appendix A, photograph 3).

Figure 1 provides a side scan sonar coverage map; approximately 85% of the water lot portion of the Site was captured with the sonar imagery. Log booms and other structures on the eastern portion of the Site restricted boat access to this area; as a result, the side scan sonar coverage in this area is limited. It is noted that the side scan image quality varied from very good to moderate throughout the survey area. Factors that periodically eroded the image quality included: underwater currents that caused the towfish to wobble thereby distorting the image, objects that produced an acoustic shadow (i.e., blind-spot) in the images (e.g., pilings, boulders, barges), and the blind-spot produced directly under the sonar track. In general, the quality of the image was sufficiently clear to resolve suspected benthic debris.

Bottom sediment appeared to be relatively consistent, and comprised of a fine grain sediment material. Evidence of cobbles or boulders was not observed in the imagery, with the exception of the shoreline, where artifacts indicative of riprap armouring is visible. Suspected benthic debris appeared to be limited to scattered logs varying from low density (e.g., one or a few logs in proximity) to moderate density (e.g., numerous logs in proximity). In total, we identified eleven 'noteworthy' log piles; a summary of each and image capture are provided in Appendix B. Evidence of other anthropogenic structures were not observed (e.g., submerged boats/ equipment or discarded debris).

In addition to the benthic debris assessment, a sediment sampling program was conducted on November 5, 2021. The purpose of the program was to assess the sediment quality for potential contaminants of concern, including metals and polycyclic aromatic hydrocarbons (PAH). The sediment samples were collected in 16 locations scattered throughout the water lots using a hydraulicly actuated Van Veen dredge sampler mounted to the bow of a boat and lowered using a winch. The sample data was compared to applicable Federal and Provincial standards. No contamination was identified. During collection of the sediment samples, trace wood and bark debris was observed; however, no significant continuous bark matting was observed. An example of the sediment can be seen in Photograph 5 (attached).

4.0 CONCLUSIONS

The site showed minimal anthropogenic debris. About 11 clusters of logs in the survey area. Material adverse ecological effects would not be expected.

5.0 STATEMENT OF LIMITATIONS AND CONDITIONS FOR REPORT

5.1 Complete Report

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to PGL by the Client, communications between PGL and the Client, and any other reports, proposals or documents prepared by PGL for the Client relative to the specific site described herein, all of which together constitute the Report.

In order to properly understand the suggestions, recommendations and opinions expressed herein, reference must be made to the whole of the Report. **PGL is not responsible for use by any part of portions of the Report without reference to the whole report.**

5.2 Basis of Report

The Report has been prepared for the specific site and purposes that are set out in the contract between PGL and the Client. The findings, recommendations, suggestions, or opinions expressed in the Report are only applicable to the site and purposes in relation to which the Report is expressly provided, and then only to the extent that there has been no material alteration to or variation from the information provided or available to PGL.

5.3 Use of the Report

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report or any portion thereof without PGL's written consent, and such use shall be on terms and conditions as PGL may expressly approve. Ownership in and copyright for the contents of the Report belong to PGL. Any use which a third party makes of the Report, is the sole responsibility of such third party. **PGL accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report.**

CLOSING

We trust that this meets your needs. If you have any questions or require clarification, please contact Corrie Allen or Cory Nelson at 604-398-2170 and 604-895-7657, respectively.

PGL ENVIRONMENTAL CONSULTANTS

Per:

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Environmental Consultant

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William Gaherty, M.S., P.Eng.
President

CRA/CPN/WDG/ncb/mtl/cdf
\\pgl-van-file1\Project Files\3000-3099\3014 - Peter Kiewit and Sons Co\41-01_Client Docs\Benthic Debris Survey\l-3014-41-01 Benthic Debris Survey-v3.docx

Attachments: Figures
Appendix A Example imagery
Appendix B Noteworthy Log piles

REFERENCES

Port of Vancouver. 2016. Environmental Baseline and Exit Assessments for Tenants of the Vancouver Fraser Port Authority. Accessed on: January 11, 2022. Available at: Vxxxxxxxxxxxxxxxxxxx (portvancouver.com)

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Freehold Property

VFPA Property

Suspected Wood Debris

Drop Camera Survey Location

Parcel boundary and site features are approximate and are presented for discussion purposes only.

0 250 m

1:4000

2020 ortho image and parcel data from Coquitlam Open Data and Kiewit NAD 1983 UTM Zone 10N

BENTHIC DEBRIS ASSESSMENT SURVEY AREA AND RESULTS

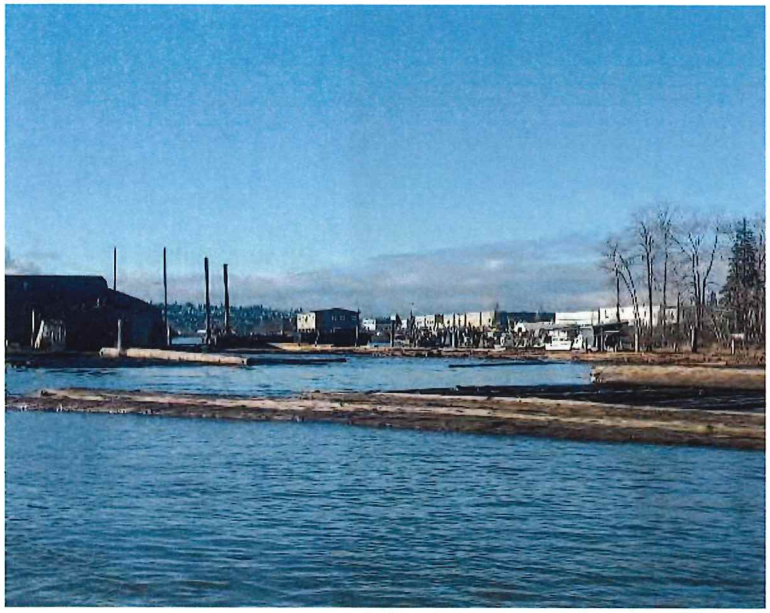
1950 Brigantine Drive, Coquitlam, BC

KIEWIT

PGL ENVIRONMENTAL CONSULTANTS

File No.:	Dwg No.:	FIGURE
3014-41.01	BDP_0010	1
Date: JAN 2022	Drawn by: RSS	

W:\BC Project Files\3000-3099\3014-41.01\Benthic Debris Program\30144101_BDP_0010_BenthicDebrisAssessmentSurveyAreaAndResults.mxd

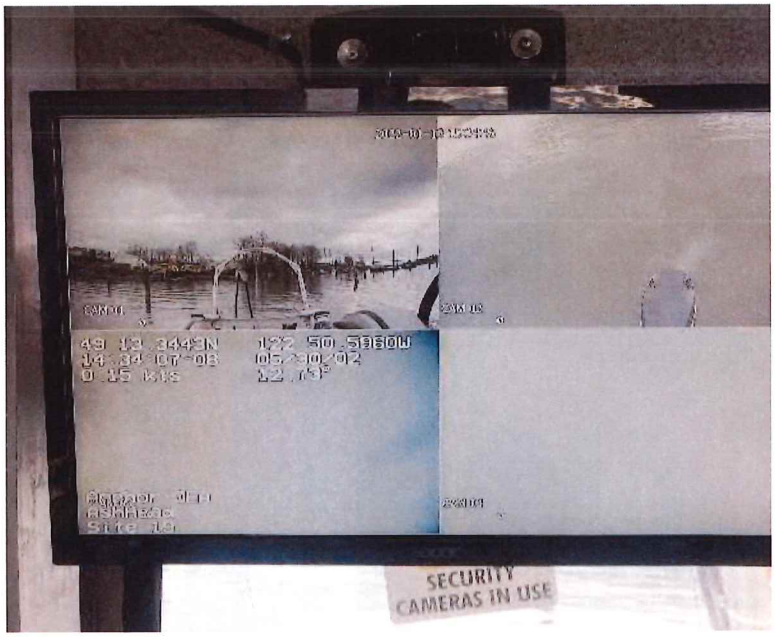


Photograph 1:
Westward (downstream) view of the water lot. Photograph taken January 13, 2022.

Photograph 2:
Eastward (upstream) view of barges and other structures in the eastern portion of the water lot. Photograph taken January 13, 2022.

Photograph 3:

Eastward view of the water lot. Photograph taken January 13, 2022.



Photograph 4:

An example of the drop camera imagery obtained at Sample Site 2. Camera 04 (the lower right image) shows imagery from the drop camera. The ponar sampler was resting on the river bottom when this photo was taken (January 13, 2022).

Photograph 5:

An example of sediment observed on November 5, 2021

Contact0000

Details
- Sonar Time at Target: 52:46 AM
- Click Position
  49.2231296909 -122.8492753186 (WGS84)
- Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-104510.xtf
- Fish Height: 6.17 Meters
- Captured at a scan beam distance of 20 m

Comments:
Scattered low density logs

Contact0001

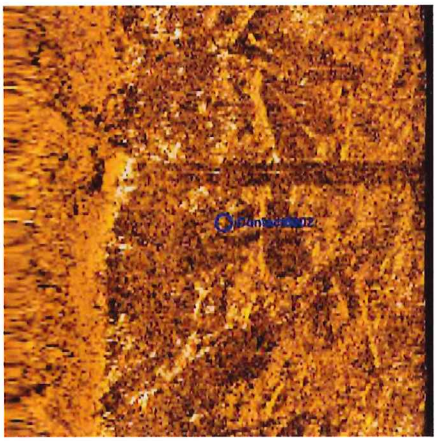
Details:
- Sonar Time at Target: 10:50:51 am
- Click Position
49.2227244181 -122.8467176909 (WGS84)
- Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-104510.xtf
- Fish Height: 6.80 Meters
- Captured at a scan beam distance of 20 m

Comments:
Scattered, low density logs

Contact 00002

Details:
- Sonar Time at Target:10:50:16 am
- Click Position
  49.2226435987 -122.8459613710 (WGS84)
- Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-104510.xtf
- Fish Height: 3.98 Meters
- Captured at a scan beam distance of 20 m

Comments:
Appears to be scattered, moderate density logs.
An acoustic shadow likely generated from sloped bathometry is precluding part of the image.



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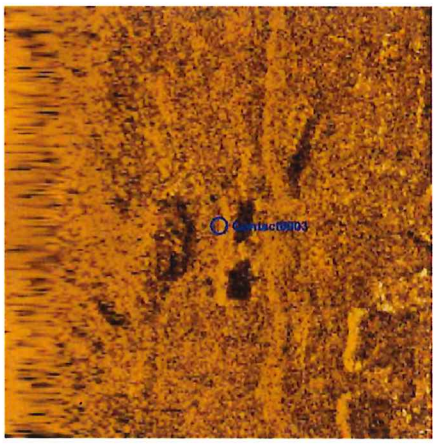
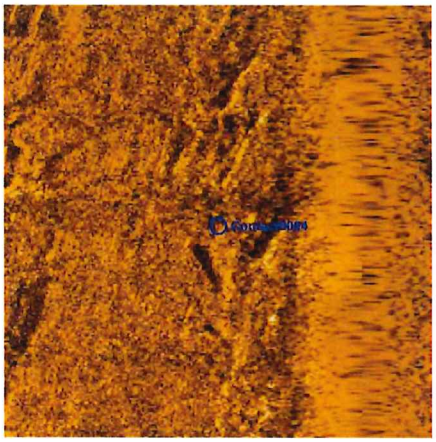
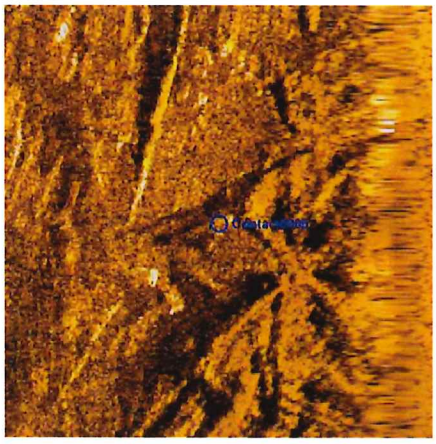
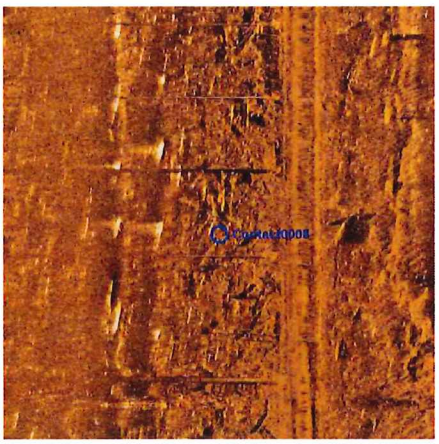
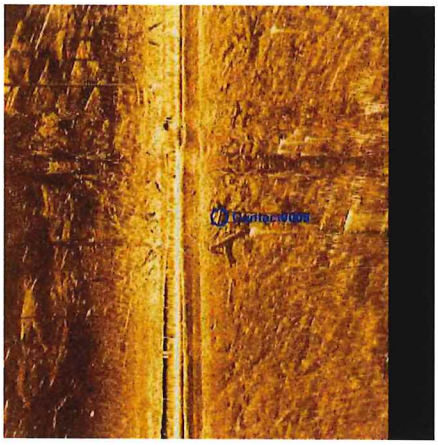
Contact0003 **Details** • Sonar Time at Target: 12:56:05 pm • Click Position 49.2228926012 -122.8498609783 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-124311.xtf • Fish Height: 6.21 Meters • Captured at a scan beam distance of 20 m **Comments:** Very low density logs.	
Contact0004 **Details:** • Sonar Time at Target: 12:55:31 pm • Click Position 49.2226698639 -122.8492703834 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-124311.xtf • Fish Height: 6.00 Meters • Captured at a scan beam distance of 20 m **Comments:** Moderate density log pile.	
Contact 00005 **Details:** • Sonar Time at Target: 12:47:16 PM • Click Position 49.2214147972 -122.8397515576 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-124311.xtf • Fish Height: 5.10 Meters • Captured at a scan beam distance of 20 m Comments: High density log pile	

Contact0006 **Details:** • Sonar Time at Target: 12:46:40 PM • Click Position 49.2214291009 -122.8390707998 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-124311.xtf • Fish Height: 4.98 Meters • Captured at a scan beam distance of 20 m **Comments:** Low density log pile	
Contact0007 • Sonar Time at Target: 12:46:20 PM • Click Position 49.2214957160 -122.8387182249 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-124311.xtf • Fish Height: 5.04 Meters • Captured at a scan beam distance of 20 m **Comments:** Moderate density log pile.	
Contact0008 • Sonar Time at Target: 2:13:00 PM • Click Position 49.2226726630 -122.8452284892 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-140723.xtf • Fish Height: 2.34 Meters • Captured at a scan beam distance of 100 m **Comments:** Moderate density log pile. The horizontal lines are acoustic shadows cast by pilings.	

Contact 0009 • Sonar Time at Target: 2022-01-13 1:37:29 PM • Click Position 49.2227692168 -122.8479403847 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-132712.xtf • Fish Height: 2.25 Meters • Captured at a scan beam distance of 100 m **Comments:** Low density log pile. The horizontal lines are acoustic shadows cast by pilings.	
Contact 0010 • Sonar Time at Target: 12:27:07 PM • Click Position 49.2232664110 -122.8468703884 (WGS84) • Acoustic Source File: C:\Users\callen\Desktop\Yellowfish raw data\13jan2022-122411.xtf • Fish Height: 2.48 Meters • Captured at a scan beam distance of 20 m. **Comments:** Low density log pile.