RAIL TRAIL PERMIT

BETWEEN:

OKANAGAN INDIAN BAND

AND:

CITY OF KELOWNA

Duck Lake Indian Reserve No. 7

Dated for Reference: April 24, 2023

Copy _____ of _____

RAIL TRAIL PERMIT

This permit, dated for reference April 24th 2023, is made between:

OKANAGAN INDIAN BAND, a "band" within the meaning of the *Indian Act* having an office at 12420 Westside Road, Vernon, BC, V1H 2A4

("OKIB")

and:

CITY OF KELOWNA, a municipality under the laws of British Columbia having an office at 1435 Water Street, Kelowna, BC V1Y 1J4

("Kelowna")

BACKGROUND:

A. The Reserve has been set apart for the use and benefit of OKIB;

B. Kelowna has requested to use the Permit Area as part of the Okanagan Rail Trail;

C. OKIB has agreed to authorize Kelowna to construct, operate and maintain a trail on the Permit Area on the terms and conditions set out in this Permit; and

D. The Council consented to the issuance of this Permit, and authorized its signatories to execute this Permit on behalf of OKIB, by way of resolution attached as Schedule A.

NOW THEREFORE, for mutual consideration, the Parties agree as follows:

1. **DEFINITIONS**

1.1 In this Permit, including the recitals, the following terms have the meanings ascribed to them in this section:

"**Adjacent Area**" means the approximately 1.5 metre area on either side of the Works Area.

"**Authority**" means any federal, provincial, municipal, OKIB or other governmental authority having jurisdiction in respect of the Permit Area, or the use of the Permit Area, including any utility company lawfully acting under its statutory power.

"**Authorized Uses**" means the uses referred to in subsection 3.1.1.

"**Commencement Date**" means the date that the Permit Area is set apart as a reserve under section 4 of the *Addition of Lands to Reserves and Reserve Creation Act*, S.C. 2018, c. 27, s. 675.

"**Construct**" includes to lay down, construct, install, erect, effect major repairs or replacement, alter, upgrade and reconstruct, but does not include regular ongoing maintenance required under section 3.8, and "**Construction**" has a similar meaning when the context requires.

"**Construction and Environmental Management Plan**" means:

(a) plans, design briefs and construction specifications and standards that are consistent with those used for other portions of the Okanagan Rail Trail off of Reserve, prepared and certified by an Engineer, on the basis that they may be relied upon by the Parties; and

(b) any other documents about the Works reasonably required by OKIB which comply with or are consistent with applicable Laws and includes plans and any mitigations measures required to address how any impacts on the Environment during construction or removal of the Works will be managed.

"**Contaminant**" includes any toxic substance, deleterious substance, hazardous substance, hazardous waste, hazardous recyclable, ozone-depleting substance, halocarbon, pesticide, waste, designated material or substance as defined in or pursuant to any applicable Environmental Laws.

"**Council**" means OKIB's "council of the band" within the meaning of the *Indian Act*.

"Engineer" means a person who is licensed to practice as an engineer in the province of British Columbia.

"**Environment**" has the meaning given it in the *Canadian Environmental Protection Act, 1999*, S.C. 1999, c. 33.

"**Environmental Laws**" means:

(a) any Laws relating, in whole or in part, to the assessment and protection of the Environment; and

(b) any decisions, determinations, mitigation measures, standards, codes, guidelines or environmental protection measures made pursuant to those Laws.

"**Indian Act**" means the *Indian Act*, R.S.C. 1985, c. I-5.

"**Laws**" means all laws, statutes, regulations, codes and by-laws, as amended or replaced from time to time.

"**Okanagan Rail Trail**" means the recreational multi-use pathway travelling from Kelowna to the District of Coldstream, which is approximately four (4.0) metres wide and spans 2,300 metres within the Reserve, constructed as a continuous, compacted aggregate or asphalt paved trail, for the use of pedestrians, bicycles, e-bikes and other non-motorized modes of transportation, as well as wheelchairs, motorized scooters or similar mobility assistance devices used exclusively by persons with disabilities.

"**Party**" means a party to this Permit and "**Parties**" means more than one of them.

"**Permit**" means this agreement, and all Schedules attached to it, as amended from time to time.

"**Permit Area**" means the area more particularly known and described as:

> In the Province of British Columba
> In Osoyoos Division of Yale District
>
> All of the Railway through Duck Lake Indian Reserve No. 7 as shown on Plan RR1222A recorded in the OKIB Lands Surveys Records in Ottawa.
>
> Containing about 17.36 acres (7.025 hectares).

"**Person**" includes any individual, partnership, firm, company, corporation, incorporated or unincorporated association or society, co-tenancy, joint venture, syndicate, fiduciary, estate, trust, bank, government, governmental or quasi-governmental agency, board, commission or authority, organization or any other form of entity however designated or constituted, or any group, combination or aggregation of any of them.

"**Release**" includes discharge, dispose of, spray, inject, inoculate, abandon, deposit, spill, leak, leach, seep, pour, emit, empty, throw, dump, place or exhaust.

"**Reserve**" means Duck Lake Indian Reserve No.7, which has been set apart for the use and benefit of OKIB.

"**Schedule**" means an attachment to this Permit labeled as a Schedule, which forms part of and is integral to the Permit.

"**Taxes**" means any tax of an Authority applicable to the granting of this Permit or the payment of Fees.

"**Term**" means the period starting on the Commencement Date and expiring on the date Kelowna no longer requires the Permit Area for any of the Authorized Uses, unless this Permit ends early.

"Willful Misconduct" means any act or failure to act (whether sole, joint or concurrent) by a Party that was intended to cause the harmful consequences to the safety or property of a Person which the Party knew, or should have known, would result from such act or omission.

"**Works**" means the components of the Okanagan Rail Trail that include the paved pathway, subgrade to the pathway, drainage system, road crossings, benches, pedestrian bridges, rock fall stabilization, erosion control, stormwater drainage components, fencing and trail signage. The works also include interpretive signage to communicate various natural issues, heritage and culture.

"**Works Area**" means the approximately four (4) metre wide portion of the Permit Area containing the former rail bed on which the Okanagan Rail Trail is to be constructed, as generally shown on the sketch attached as Schedule B.

2. INTERPRETATION AND GENERAL PROVISIONS

2.1 **Definitions** – Defined words are capitalized for ease of reference. A defined word may be read as having an appropriate corresponding meaning when it is used in the singular, plural, noun or verb form.

2.2 **Parts of the Permit** – These are the parts of this Permit: article (1.); section (1.1); subsection (1.1.1); and paragraph (1.1.1.1). Unless stated otherwise, any reference in this Permit to an article, section, subsection, or paragraph means the appropriate part of this Permit.

2.3 **Headings** – All headings in this Permit have been inserted as a matter of convenience and for reference only and in no way define, limit, enlarge, modify or explain the scope or meaning of the Permit or any of its provisions.

2.4 **Extended Meaning**

2.4.1 A word in the singular form may be read in the plural form if the context allows it and a word in the plural form may be read in the singular form if the context allows it. All genders are included in any gender expressed.

2.4.2 The words "include", "includes" and "including" are to be read as if they are followed by the phrase "without limitation".

2.4.3 The phrase "this Permit ends" includes an ending by expiration of the Term and an earlier termination. The phrases "earlier termination" and "early termination" include a surrender.

2.4.4 The phrase "on the Permit Area" includes in, under and above the Permit Area.

2.5 **Joint and Several** – If a Party is comprised of more than one Person, then all covenants and agreements of that Party are joint and several.

2.6 **Statutes** – Any reference to a statute means that statute, and any regulations made under it, all as amended or replaced from time to time.

2.7 **Governing Laws** – This Permit will be governed by and interpreted in accordance with the applicable Laws of OKIB and of the Province of British Columbia.

2.8 **Entire Agreement** – This Permit constitutes the entire agreement between the Parties with respect to the subject matter of this Permit and supersedes and revokes any and all previous discussions, negotiations, arrangements, letters of intent, offers and representations. There are no other covenants, agreements, representations or warranties between the Parties whatsoever other than those set out in this Permit.

2.9 **Modification** – Any modifications of this Permit will be in writing and executed in the same manner as this Permit.

2.10 **Time is of the Essence** – Time is of the essence in this Permit and time will remain of the essence notwithstanding any extension granted to a Party.

2.11 **Severability** – If any part of this Permit is declared or held invalid for any reason, the invalidity of that part will not affect the validity of the remainder of the Permit, which will continue in full force and effect and be construed as if this Permit had been executed without the invalid part.

2.12 **Survival of Obligations and Rights** – If a part of this Permit states that it survives when this Permit ends, then the survival of that part is only to the extent required for the performance of any obligations, and the exercise of any rights, pertaining to it.

2.13 **Others Performing Kelowna's Obligations** – Kelowna may allow any Person to perform Kelowna's obligations under this Permit, but in doing so Kelowna will ensure performance of such obligations by such Persons and it in no way affects Kelowna's obligation to perform.

3. USE OF THE PERMIT AREA

3.1 Kelowna's Rights to the Permit Area

3.1.1 Subject to every other part of this Permit, OKIB hereby authorizes the non-exclusive use of the Permit Area for the Term as follows:

3.1.1.1 On the Works Area, Kelowna, its employees, contractors, subcontractors, agents and invitees (including all members of the public) may:

(a) pass along and over and upon the Works Area for public recreation purposes;

(b) exercise the rights provided in paragraph 3.1.1.1.a by foot, bike, e-bike or other non-motorized modes of transportation as well as wheelchairs, motorized scooters or similar mobility assistance devices used exclusively by persons with disabilities;

(c) clear the Works Area and keep it clear of debris and anything which, in the opinion of Kelowna, constitutes or may constitute an obstruction to the Authorized Uses under this Permit;

(d) construct, operate and maintain the Works; and in the case of access for the purposes permitted under 3.1.1.1.c and this paragraph, such as for transporting material and equipment, by such methods of motorized vehicles as may be reasonably required; and

(e) carry out all activities necessary or incidental to the foregoing purposes.

3.1.1.2 On the Adjacent Area, Kelowna, its employees, contractors, subcontractors and agents may:

(a) enter, go, pass along, over and upon the Adjacent Area for the purpose of access to and egress from the Works Area; and

(b) clear the Adjacent Area and keep it clear of debris and anything which, in the opinion of Kelowna, constitutes or may constitute an obstruction to the Authorized Uses under this Permit.

3.1.2 This is a license. The rights provided under this Permit do not, and will not be deemed to, convey or confer on Kelowna any title, fee, estate, or other right "in rem" in the Permit Area.

3.1.3 Kelowna will comply with all applicable Laws regarding this Permit, the Permit Area and any activity on the Permit Area and will require and ensure that any other Person on the Permit Area because of Kelowna's rights under this Permit also complies with all applicable Laws regarding this Permit, the Permit Area and any activity on the Permit Area.

3.1.4 Kelowna will not cause or permit any nuisance on the Permit Area.

3.1.5 Kelowna will not cause or permit the commission of any waste of the Permit Area.

3.2 **Prior Rights** – This Permit is subject to any existing interest or right given for or attaching to the Permit Area, whether or not Kelowna has notice of such prior interest or right.

3.3 **Subsequent Rights** – Kelowna acknowledges that OKIB may authorize further use and occupation of the Permit Area, subject to Kelowna's rights under this Permit. If OKIB authorizes any further use or occupation of the Permit Area, OKIB will notify Kelowna of any such use or occupation.

3.4 **No Dispositions** – Kelowna must not assign, mortgage, or otherwise dispose of any of its interest in this Permit and any purported assignment, mortgage, or disposition is void.

3.5 **Representations about the Permit Area and its Authorized Use** – Kelowna acknowledges and agrees that OKIB is authorizing Kelowna's use of the Permit Area on an "as is – where is" basis and that OKIB, and its officials, servants, employees, agents, contractors, subcontractors or other legal representatives, nor the Council has made any representations or warranties with respect to:

3.5.1 the condition of the Permit Area or any improvements on the Permit Area, including the Permit Area's compliance with any Laws or the presence of Contaminants on the Permit Area;

3.5.2 issues of title or encumbrances affecting title; or

3.5.3 the suitability of the Permit Area for the Authorized Uses.

3.6 **Damage to, or Destruction of, Works** – Subject to section 3.7, if any Works are damaged or destroyed during the Term, then:

3.6.1 this Permit will not be deemed to have ended; and

3.6.2 Kelowna will repair or replace the Works within a reasonable time and, to the extent possible, to a standard at least substantially equal in quality of material and workmanship to the original material and workmanship.

3.7 **Damage to, or Destruction of Works by OKIB**

3.7.1 If any Works are damaged or destroyed by the negligence or Willful Misconduct of OKIB's employees in the course of carrying out their duties as an employee during the Term, then:

3.7.1.1 OKIB will promptly notify Kelowna of the damage; and

3.7.1.2 Kelowna will repair or replace the Works within a reasonable time and, to the extent possible, to a standard at least substantially equal in quality of material and workmanship to the original material and workmanship, the reasonable costs of which will be paid by OKIB to Kelowna.

3.7.2 If, to OKIB's knowledge, any Works are damaged or destroyed by the actions of OKIB's contractors, subcontractors or agents during the Term, then:

3.7.2.1 OKIB will promptly notify Kelowna of the damage; and

3.7.2.2 Kelowna will repair or replace the Works within a reasonable time and, to the extent possible, to a standard at least substantially equal in quality of material and workmanship to the original material and workmanship and Kelowna acknowledges that OKIB will not be responsible for the costs of repair and replacement and will seek recovery of such costs from OKIB's contractor, subcontractor or agent.

3.8 **Repair & Maintenance –** OKIB will not be required to maintain or make any repairs to any Works. Kelowna will repair and maintain the Works in good order and condition in all respects in accordance with existing Okanagan Rail Trail standards from time to time, provided that Kelowna will not use pesticides or herbicides in doing so.

4. PAYMENTS TO OKIB

4.1 **Payments** – All payments made by Kelowna to OKIB under section 4.3 of this Permit will be:

4.1.1 paid in Canadian dollars;

4.1.2 paid to OKIB;

4.1.3 paid without any prior demand, set-off, deduction or abatement; and

4.1.4 accompanied by any applicable Taxes.

4.2 **Prepaid Fees** - Kelowna paid Prepaid Fees of $10.00 to OKIB on the Commencement Date, the receipt and sufficiency of which are hereby acknowledged by the parties.

4.3 **Amounts Owing to OKIB** – If, at any time before or after this Permit ends, OKIB incurs any expenses by reason of any failure of Kelowna to perform or observe any of Kelowna's obligations under this Permit, then the amount of each expense, together with interest, accruing from thirty (30) days after receipt of notice of the expense from OKIB, and an administration fee of 15% of the expenses, will be payable to OKIB by Kelowna.

4.4 **Arrears to Bear Interest** – If any sum owing to OKIB by Kelowna under this Permit is not paid when due, then Kelowna will pay interest on the unpaid amount at the prime lending rate established by the Bank of OKIB, calculated quarterly and compounded semi-annually, plus 5% per annum, from the date the amount owing or sum are due until the date that the payment is received. This stipulation for interest will not prejudice or affect any remedies of OKIB under this Permit or otherwise, or be construed to relieve Kelowna from any default in paying any other sum at the time and in the manner specified in this Permit.

4.5 **Survival of Article** – This Article survives when this Permit ends.

5. CONSTRUCTION

5.1 **No Construction or Removal Before Review** – Before beginning any Construction or removal of any Works on the Permit Area, or altering the Permit Area in anticipation of such Construction or removal, Kelowna will arrange for an OKIB stewardship/environmental monitor to be present (at Kelowna's cost) during Construction or removal and Kelowna will:

5.1.1 apply to any appropriate Authority for, and obtain, any necessary approvals and authorizations; and

5.1.2 deliver to OKIB a Construction and Environmental Management Plan that indicates that, subject to any required mitigation, the Construction or removal of the Works is not likely to cause any significant adverse environmental effects on the Permit Area.

5.2 **Stop Work Orders and Injunctions** – If section 5.1 is breached, then, in addition to any other remedy available to OKIB:

5.2.1 OKIB may issue a "stop work order", which OKIB is entitled to post in conspicuous locations on the Permit Area;

5.2.2 OKIB may bar any Person performing any physical activity that is contributing to such breach from the Reserve until such time as the breach is rectified by obtaining all of the required approvals, authorizations and plans required under section 5.1;

5.2.3 Kelowna will promptly remediate any damage to the Permit Area and any other area on the Reserve arising from such breach; and

5.2.4 OKIB is entitled to obtain an injunction from a court of competent jurisdiction against the continuation of such breach, its costs which (including legal costs on a solicitor and own client basis) are to be paid promptly upon notice to Kelowna.

5.3 **Release of Liability** – Kelowna releases OKIB and its officials, servants, employees, agents, contractors, subcontractors and other legal representatives from any liability associated with their reviews of, and Kelowna's implementation of, any Construction and Environmental Management Plan. This section survives when this Permit ends.

5.4 **Construction Compliance** – Once all applicable approvals, authorizations and plans referred to in section 5.1 have been obtained, finalized or delivered, as the case may be, for any Works, Kelowna will:

5.4.1 promptly Construct such Works in a proper and workmanlike manner and in accordance with all required approvals, authorizations, plans and determinations and to at least the standards of the portions of the Okanagan Rail Trail located off-Reserve; and

5.4.2 ensure that the site preparation, Construction, operation and decommissioning of the Works, will comply with any mitigation measures, including monitoring and compliance, set out in the Construction and Environmental Management Plan.

5.5 **Plans** – After the completion of the Works, Kelowna will promptly deliver to OKIB a certificate from the City of Kelowna Engineer certifying that the Works have been constructed in accordance with the Construction and Environmental Management Plan and this Permit and that the standards referred to in subsection 5.4.1 have been met.

6. INSURANCE

6.1 Liability Insurance

6.1.1 Kelowna will obtain and maintain commercial general liability insurance against claims for bodily injury (including death), personal injury or property damage arising in connection with its use of the Permit Area. The policy will be written on a commercial general liability basis with liability limits of at least $5,000,000 per occurrence (or to any higher amount that OKIB reasonably requires by delivery of notice to Kelowna) and with OKIB as an additional insured.

6.1.2 The liability insurance policy will contain:

6.1.2.1 an agreement by the insurer that it will not cancel the policy without first giving the additional insured at least thirty (30) days prior notice; and

6.1.2.2 a waiver of subrogation by the insurers against the additional insured.

6.1.3 Kelowna will not do anything, or permit or suffer anything to be done that might cause the insurance policy to be invalidated or cancelled or that could affect the right of OKIB to recover for a loss.

6.1.4 On the Commencement Date, Kelowna will promptly deliver a certificate evidencing the insurance policy to OKIB, and will deliver to OKIB, at least fifteen (15) days before the expiry of any such insurance, a certificate of renewal, or other evidence satisfactory to each such party, that the insurance has been renewed or replaced.

6.1.5 Kelowna will, upon request from OKIB, deliver to OKIB a certified copy of every requested insurance policy.

6.2 **Release of Insured Claims** – Kelowna releases OKIB and OKIB's officials, servants, employees and other legal representatives from all liability for loss (including economic loss), damage or injury (including any loss, damage or injury that may arise out of the negligence or omission of any of them) in any way caused by or resulting from any of the perils or injury against which it has covenanted in this Permit to insure, except to the extent that such loss, damage or injury is caused by the negligence or Willful Misconduct of OKIB, or OKIB's officials, servants, employees, and other legal representatives in the course of carrying out their duties.

6.3 **Cancellation of Insurance** – Kelowna will immediately notify OKIB if any insurance policy required under this Permit is:

6.3.1 cancelled or threatened to be cancelled, and promptly deliver evidence of a certificate of renewal or other evidence satisfactory to such Party that the insurance has been renewed or replaced at least fifteen (15) days before the cancellation of such policy; or

6.3.2 suspended, and promptly provide evidence to such Party that the policy has been reinstated or replaced.

7. ENVIRONMENT

7.1 Compliance with Environmental Laws

7.1.1 Kelowna will not carry out any operations or activities, or construct any Works, that in the reasonable opinion of OKIB materially increase the risk of liability to OKIB (whether directly or indirectly) as a result of the application of Environmental Laws.

7.2 **Environmental Matters**

7.2.1 Kelowna will provide OKIB with certification from the City of Kelowna Engineer of the implementation, within the timelines specified in such determination, of all mitigation measures, including monitoring and compliance, required under such determination.

7.3 **Environmental Site Assessment**

7.3.1 Tetra Tech Canada Inc., a qualified independent consultant undertook an environmental site assessment of the environmental condition of the Permit Area and prepared a Human Health and Ecological Risk Assessment: CN Railway Right-of-Way Mile 105.9 to 106.6 and Mile 107.0 to 107.5 Duck Lake Indian Reserve 7, a copy of which is attached as Schedule C.

7.3.2 Within one hundred and twenty (120) days after the termination of this Permit, Kelowna will have a qualified independent consultant undertake an environmental site assessment of the environmental condition of the Permit Area at that time and will provide OKIB with a report on such condition. The report will state that it may be relied upon by all Parties and Kelowna agrees that all Parties may rely upon it.

7.3.3 The environmental site assessment reports referred to in subsections 7.3.1 and 7.3.2 will be *prima facie* evidence of the environmental condition of the Permit Area immediately prior to the Commencement Date and immediately prior to the expiration of this Permit or immediately after the earlier termination of this Permit, as the case may be.

7.3.4 Prior to the end of the Term, or within sixty (60) days after the issuance of the report referred to in subsection 7.3.2 if this Permit ends early, Kelowna will remediate any Contamination of the Permit Area arising from Kelowna's (or any Person on the Permit Area because of Kelowna's rights under this Permit) use of the Permit Area to the environmental condition of the Permit Area identified in the report referred to in subsection 7.3.1 or to such other environmental condition as may be acceptable to OKIB.

7.4 **Contaminants and Releases**

7.4.1 Prior to the end of the Term or within ninety (90) days after the earlier termination of this Permit, Kelowna will remove from the Permit Area any Contaminants that are, or have been, located, stored or incorporated on the Permit Area by Kelowna or any Person on the Permit Area because of Kelowna's rights under this Permit and, upon removal, will promptly provide OKIB with documentation satisfactory to each of them, confirming the completion of the removal satisfactory to each of them and any Authority.

7.4.2 Upon the Release of any Contaminants by Kelowna or any Person on the Permit Area because of Kelowna's rights under this Permit, Kelowna will:

7.4.2.1 immediately deliver notice to OKIB and any appropriate Authority of the occurrence of the Release;

7.4.2.2 ensure that any notice includes details relating to the Release, including the time and extent of the Release, the estimated amount of such

Contaminants, the remedial action taken prior to the delivery of the notice, and the remedial action that Kelowna intends to take in order to contain or rectify the Release;

7.4.2.3 immediately remove from the Permit Area such Contaminants, and take all remedial action necessary to fully rectify the effects of the Release, in compliance with all reasonable requests by OKIB and all applicable Environmental Laws;

7.4.2.4 provide OKIB with an environmental site assessment report, satisfactory to OKIB, prepared by a qualified independent consultant, specifying Kelowna's activities under paragraph 7.4.2.3 and the state of the Permit Area after the completion of such activities as compared to the state of the Permit Area prior to the Release, and stating that such report may be relied upon by all Parties, and Kelowna agrees that OKIB may rely on such report;

7.4.2.5 undertake such further activities as may reasonably require to remove such Contaminants and rectify the Release, based on the report referred to in this section; and

7.4.2.6 the Release of Contaminants in this section does not contemplate materials used for the regular operations and maintenance of the Okanagan Rail Trail for the permitted uses such as de-icing salt and sand for grit.

7.5 **Representation and Warranty** – Kelowna represents and warrants to OKIB that Kelowna's use of the Permit Area will not involve the Release of any Contaminants.

7.6 **Survival of Article** – This Article survives when this Permit ends.

8. DEFAULTS, EARLY TERMINATION AND END OF PERMIT

8.1 Defaults on Obligations Owed to OKIB

8.1.1 If Kelowna defaults on any obligation owed to OKIB under this Permit, then OKIB may deliver to Kelowna a default notice.

8.1.2 Kelowna will cure the default identified in a default notice within fifteen (15) days of delivery for a default of an outstanding payment under section 4.3 of this Permit. If Kelowna does not cure that default within fifteen (15) days, then OKIB may declare the Term ended by delivering a termination notice to Kelowna, with a copy to OKIB.

8.1.3 Kelowna will cure the default identified in a default notice within thirty (30) days of delivery for a default of any obligation other than an outstanding payment obligation. If such default:

8.1.3.1 can reasonably be cured within thirty (30) days after the default notice is delivered and Kelowna fails to cure such default within the thirty (30) days; or

8.1.3.2 cannot reasonably be cured within thirty (30) days after the default notice is delivered and Kelowna does not begin to cure such default within the thirty (30) days to the reasonable satisfaction of OKIB or continue to cure such default with due diligence after beginning to cure,

then OKIB may sue Kelowna for damages.

8.1.4 If a default is not cured within the time provided for under this Permit, then OKIB may cure that default in OKIB's sole discretion. Any of OKIB's expenses will be payable by Kelowna within thirty (30) days of delivery of notice from OKIB.

8.1.5 If OKIB begins to cure a default, then OKIB will have no obligation to continue to cure such default to completion and OKIB is not liable for any losses or expenses suffered by Kelowna, or any Person on the Permit Area due to the rights of Kelowna under this Permit, arising due to OKIB's actions under this section.

8.2 **Surrender of the Permit** – When this Permit ends, Kelowna will peaceably surrender and yield up use and occupation of the Permit Area to OKIB, in the condition required by the terms of this Permit and all Works will be the property of OKIB absolutely, free of all encumbrances and for no compensation.

8.3 **Permit Area No Longer Required –** If Kelowna determines that it no longer requires the Permit Area for any of the Authorized Uses, then Kelowna will give OKIB reasonable notice that this Permit will end on a date specified in the notice.

8.4 **Challenge by OKIB –** If OKIB determines that, in its view, the Permit Area is no longer required by Kelowna for any of the Authorized Uses, it may request that Kelowna give the notice required under section 8.3. If Kelowna declines to give the notice, or disputes that it is required, then the dispute may be submitted by any Party to the applicable dispute resolution process in Article 11.

9. INDEMNITY

9.1 **Kelowna's Indemnity of OKIB** – Kelowna will be liable for all loss, costs, damages, and expenses whatsoever incurred or suffered by OKIB and OKIB's elected officials, servants, employees and other legal representatives (the Additional Indemnities) including but not limited to damage to or loss of property and loss of use thereof, and injury to or death of a person or persons resulting from or in connection with a default of any of Kelowna's obligations under this Permit or the exercise by Kelowna of its rights or the performance, purported performance, or non-performance of activities under this Permit carried out or permitted by Kelowna, its workers, employees, agents, contractors subcontractors or invitees, excepting only where such loss, costs, damages and expenses are as a result of the negligence or Willful Misconduct of OKIB or the Additional Indemnities, in the course of carrying out their duties.

9.2 Kelowna will defend, indemnify and hold harmless OKIB and the Additional Indemnities from and against all claims, demands, actions, proceedings, and liabilities whatsoever and all costs and expenses incurred in connection with or resulting from a default of Kelowna's obligations under this Permit or the exercise by Kelowna of its rights or the performance, purported performance, or non-performance of activities under this Permit carried out or permitted by Kelowna, its workers, employees, agents, contractors subcontractors or invitees excepting only where such claim, demand, action, proceeding or liability is based on the negligence or Wilful Misconduct of OKIB or the Additional Indemnities, in the course of carrying out their duties.

9.3 **Survival of Article** – This Article survives when this Permit ends.

10. DELIVERY

10.1 **General Requirement** – All notices, requests, and demands under this Permit, which will be in writing, and all amount payable to OKIB will be paid, and will be delivered in accordance with this Article to the following addresses:

To OKIB:

Okanagan Indian Band
12420 Westside Road,
Vernon, BC V1H 2A4
Fax: (250) 542-4990

Attention: Chief

To Kelowna:

City of Kelowna
1435 Water Street,
Kelowna, BC V1Y 1J4
Fax: (250) 862-3399

Attention: City Clerk

10.2 **Date of Delivery** – If any question arises as to the date on which payment, notice, request or demand was made, it will be deemed to have been delivered:

10.2.1 if sent by fax, the day of transmission if transmitted before 3:00 p.m., otherwise, the next day;

10.2.2 if sent by mail, on the sixth day after the notice was mailed; or

10.2.3 if sent by any means other than fax or mail, the day it was received.

If the postal service is interrupted or threatened to be interrupted, then any payment, notice, request or demand will only be sent by means other than mail.

10.3 **Change of Contact Information** – Any Party may change its contact information shown in this Permit by informing the other Parties of the new contact information, and the change will take effect thirty (30) days after the notice is delivered.

11. DISPUTE RESOLUTION

11.1 Disputes

11.1.1 Any dispute arising from or under this Permit between OKIB and Kelowna will be resolved as follows:

11.1.1.1 Negotiation: The Party who wishes a dispute to be resolved will deliver a dispute notice to the other Party. Each Party will promptly designate a senior representative who will attempt in good faith to resolve the dispute by negotiation.

11.1.1.2 Mediation: If negotiation does not resolve the dispute within fifteen (15) days of delivery of the dispute notice, then either Party may deliver a

mediation notice to the other Party. The Parties will then promptly appoint a qualified, impartial and experienced mediator, the cost of which will be paid equally by both Parties. If the Parties cannot agree on a mediator within fifteen (15) days of delivery of the mediation notice, then the mediator will be appointed by the British Columbia International Commercial Arbitration Centre (or its successor, or a similar body if neither is available). Within ten (10) days of appointment of a mediator, each Party will provide the mediator and each other with a written statement of its position about the dispute and summary of the arguments supporting its position. The mediator will meet with the Parties in his or her sole discretion in an attempt to resolve the dispute. The Parties will provide any additional information requested by the mediator. The mediator may hire experts, the cost of which will be paid equally by the Parties unless the mediator orders a different division.

11.1.1.3 Arbitration: If the dispute is not resolved within thirty (30) days of the appointment of a mediator, then, on application by any Party, the dispute may be referred to a single arbitrator under the *Arbitration Act*, RSBC 1996, c 55. The decision of the arbitrator is final and binding on the Parties. The cost of the arbitrator will be paid equally by the Parties unless the arbitrator orders a different division.

12. MISCELLANEOUS

12.1 **All Terms are Covenants** – All agreements, terms, conditions, covenants, provisions, duties and obligations to be performed or observed under this Permit are deemed to be conditions as well as covenants.

12.2 **No Presumption** – There will be no presumption that any ambiguity in any of the terms of this Permit will be interpreted in favour of any Party.

12.3 **No Cost to OKIB** – Except as otherwise explicitly set out in this Permit, OKIB will not be responsible during the Term for any costs, charges or expenses arising from or relating to Kelowna's use or occupancy of the Permit Area or any of Kelowna's obligations under this Permit.

12.4 **Binding on Successors** – This Permit will be for the benefit of and be binding upon each Party's respective heirs, successors, executors, administrators, assigns and other legal representatives.

12.5 **Remedies are Cumulative** – Notwithstanding any part of this Permit that provides a remedy other than cancellation by OKIB or suing for damages by OKIB, all remedies under this Permit or at law may be exercised at the same time and the exercise of one remedy does not preclude the exercise of any other remedy.

12.6 **No Waiver** – No condoning, excusing or overlooking of any default of this Permit will operate as a waiver by, or otherwise affect the respective rights of, the other Parties in respect of any continuing or subsequent default. No waiver of these rights will be inferred from anything done or omitted to be done by any Party, except by an express waiver in writing.

12.7 **No Assumption of Responsibility** – No consent or absence of consent by OKIB will in any way be an assumption of responsibility or liability by such Party for any matter subject to or requiring such Party's consent.

12.8 **Not a Joint Venture** – Nothing in this Permit will be construed as creating a relationship of agency, partnership, joint venture or other such association between any of the Parties.

12.9 **Kelowna Authority** – Kelowna represents and warrants that:

12.9.1 it has the authority under the *Local Government Act* and/or the *Community Charter* of British Columbia to enter into this Permit and to perform all of the obligations, covenants and agreements contained in this Permit; and

12.9.2 Kelowna Council has consented to the issuance of this Permit, and authorized its signatories to execute this Permit on behalf of Kelowna.

12.10 **Counterpart Execution** – This Permit may be executed in one or more counterparts, each of which is considered to be an original but all of which together constitute one and the same document. Each Party will promptly deliver its originally executed Permit to the other Parties.

The Parties have executed this Permit on the dates indicated below.

On behalf of the OKANAGAN INDIAN BAND dated _____, 2023

_____
Chief – Byron Louis

_____
Witness

On behalf of the CITY OF KELOWNA dated _____, 2023

_____
Mayor Thomas Dyas

_____
City Clerk – Stephen Fleming

SCHEDULE "A" – Band and Council Resolution

WHEREAS:

A. Okanagan Indian Band has negotiated a Permit to be entered into between Okanagan Indian Band and City of Kelowna, to which this resolution is to be attached as a Schedule; and

B. The terms used in this resolution that are defined in the Permit have the same meaning as in the Permit.

BE IT RESOLVED that the Council, on behalf of Okanagan Indian Band:

A. has read and understood the Permit terms;

B. consents to the execution of the Permit on its terms; and

C. authorizes any two members of the Council to execute the Permit on behalf of OKIB.

DATED _____, 20___.

Quorum for the Council is _____ members.

_____
Chief

_____
Councillor

_____
Councillor

_____
Councillor

_____
Councillor

SCHEDULE "B" – Works Area

[See map attached next page]

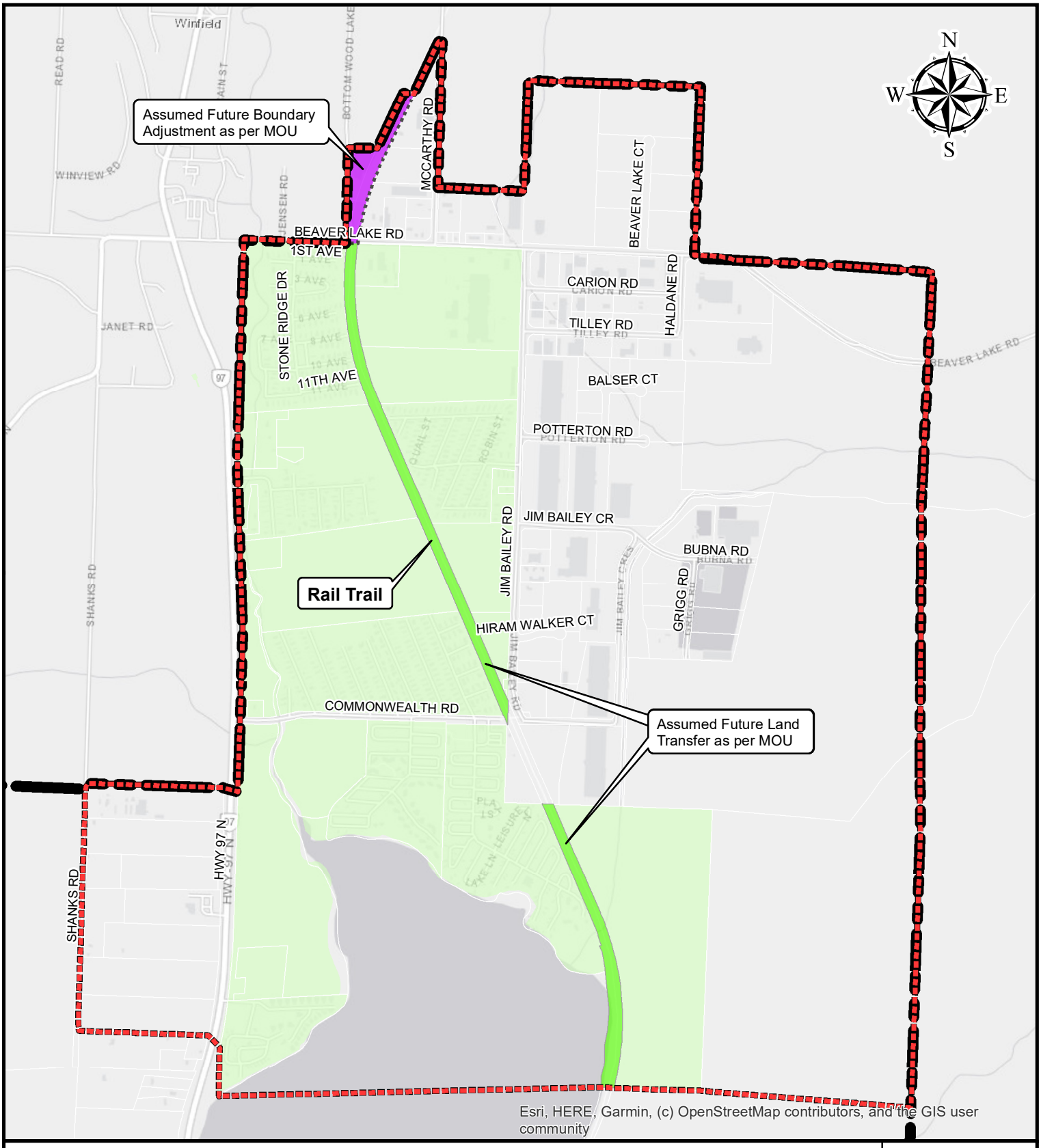

Figure A1. Beaver Lake Service Area (BLSA) - Rail Trail

Legend

- Lot Lines
- BLSA Boundary
- IR # 7
- City Boundary
- Assumed Future Boundary Adjustment as per MOU
- Assumed Future Land Transfer as per MOU

City of Kelowna

0 100 200 300
Meters

January 2023

SCHEDULE "C" – Environmental Site Assessment

[See Tetra Tech's Report titled "Human Health and Ecological Risk Assessment CN Railway Right-of-Way Mile 105.9 to 106.6 and Mile 107.0 to 107.5 Duck Lake Indian Reserve 7" on next page]

Human Health and Ecological Risk Assessment
CN Railway Right-of-Way Mile 105.9 to 106.6 and Mile 107.0 to 107.5 Duck Lake Indian Reserve 7

PRESENTED TO

OKANAGAN INDIAN BAND
INDIGENOUS AND NORTHERN AFFAIRS CANADA
CANADIAN NATIONAL RAILWAY

OCTOBER 2018
ISSUED FOR REVIEW
FILE: 704-ENW.VENW03093-02

This “Issued for Review” document is provided solely for the purpose of client review and presents our interim findings and recommendations to date. Our usable findings and recommendations are provided only through an “Issued for Use” document, which will be issued subsequent to this review. Final design should not be undertaken based on the interim recommendations made herein. Once our report is issued for use, the “Issued for Review” document should be either returned to Tetra Tech Canada Inc. (Tetra Tech) or destroyed.

Tetra Tech Canada Inc.
150, 1715 Dickson Avenue
Kelowna, BC V1Y 9G6 CANADA
Tel 250.862.4832 Fax 250.862.2941

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EXECUTIVE SUMMARY

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Okanagan Indian Band (OKIB), Indigenous and Northern Affairs Canada (INAC) and Canadian National Railway (CN) to conduct a Human Health and Ecological Risk Assessment of the CN rail line right-of-way (RoW) that lies within the boundaries of the Duck Lake Indian Reserve (IR) 7 located near the northern limits of Kelowna, BC (the Site). This Human Health and Ecological Risk Assessment follows a Phase II Environmental Site Assessment (ESA) and a Phase III ESA completed for the Site by Tetra Tech in 2016 and 2017. In addition, groundwater data collected from groundwater monitoring wells installed in 2018 are included in the risk assessment.

The risk assessment addresses the polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons and copper identified by the Phase II and Phase III ESAs to be exceeding environmental quality guidelines and standards for the Site. The risk assessment considered the potential future uses of the Site as a recreational trail or industrial use.

Based on the results of the risk assessment the following conclusions were made.

Overall Human Health Conclusions and Recommendations

The contaminants of potential concern listed above were tentatively identified by screening against Canadian Council of Ministers of Environment (CCME) guidelines and BC Contaminated Sites Regulation (CSR) standards for residential, parkland, and commercial land uses. It is noted that for the contaminants of potential concern, the commercial guidelines and standards are equivalent to industrial guidelines and standards. The comparison eliminated all chemicals as being human health concerns, but the PAHs were further evaluated for their of total potency equivalents (TPE, a measure of risk posed by direct human contact) and potential to migrate to groundwater (Index of Additive Cancer Risk, IACR, a measure of risk posed to drinking water). The calculated upper 95th percent confidence limit of the mean (95UCL) concentrations for benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, benzo(g,h,i)perylene, and indeno(1,2,3-c,d) were used to determine the TPE. The IACR value was calculated using the same PAHs, as well as chrysene, dibenzo(a,h)anthracene, and benzo(a)anthracene.

The TPE totaled 0.042, well below the screening level of 5.3. Even if multiplied by 3 to account for the source of the PAHs (creosote) per CCME 2010 recommendations, the TPE is well below 5.3. Therefore, there is little potential for human health impacts from daily, long-term Site exposure. In addition, the IACR was calculated using the 95UCL concentrations of all PAHs, and it totalled 3.55. This is in excess of the guideline value of 1.0. The IACR value is used to indicate whether a potential for leaching to groundwater is present. Evaluation of the calculation shows that, in this case, benzo(b)fluoranthene is the COPC causing the exceedance of 1.0. However, groundwater samples collected from around the Site were non-detect for benzo(b)fluoranthene and the other PAHs, providing evidence that PAHs are not leaching to groundwater at levels of concern.

Given the site-specific determination that leaching to groundwater is not occurring, and that there are no risks to humans from direct contact with the soils, no further analysis is recommended, and no soil removal or remediation action is needed based on human health concerns.

Overall Ecological Conclusions and Recommendations

Results of this screening analysis indicate that the maximum concentrations in soil of some PAHs and copper exceed CCME guidelines and CSR standards for ecological receptors. Therefore, copper, as well as benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, benzo(g,h,i)perylene, and indeno(1,2,3-c,d) were further evaluated for ecological risk.

As with the human-health risk assessment, the 95UCL concentrations of these contaminants of potential concern were calculated and compared to guideline and standard values to determine if exceedances still existed. In all cases, the 95UCL concentrations were below the lowest guideline value for the protection of ecological receptors. There is no indication that the Site poses a hazard to ecological receptors.

In addition, it is unlikely that the limited areas of impacted soil would constitute a desirable habitat area for ecological receptors as they are located within purposely compacted soils that were intended to be free of vegetation for the safe operation of the former rail line. As well, they are unlikely to be contacted on an extensive basis by ecological receptors as past use did not encourage wildlife to the RoW. Most of the RoW is located at a distance greater than 10 m from a surface water body, and sampling data have demonstrated a lack of migration of all contaminants of potential concern from the surface to subsurface.

The relatively small areas of impact, difficult growing conditions, and low habitat quality due to compacted, shallow soil make it unlikely that the copper and PAHs will have a population-level effect on plants or invertebrates. The lack of plants providing a food source to mammals would also decrease the potential for foraging by herbivores. Further, the potential future use as a recreational trail calls for regrading and replacement of surface soil, diluting any exposure concentrations, as well as providing cover to deeper soil. By limiting the potential for contact, the exposure is no longer complete and there would be no associated risk.

In conclusion, the Site has been evaluated for human health risks and found to have little potential to adversely impact humans under residential, industrial, or recreational visitor scenarios. In addition, the Site has been evaluated for ecological risks and found to present little potential for adverse impacts to terrestrial or aquatic receptors. These conclusions are based on current site conditions as determined through soil and groundwater sampling, and are appropriate to potential future site use as a recreational trail, residential land use or industrial land use.

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APPENDICES

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Okanagan Indian Band, Indigenous and Northern Affairs Canada and Canadian National Railway and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Okanagan Indian Band, Indigenous and Northern Affairs Canada and Canadian National Railway, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Okanagan Indian Band (OKIB), Indigenous and Northern Affairs Canada (INAC) and Canadian National Railway (CN) to conduct a Human Health and Ecological Risk Assessment of the CN rail line right-of-way (RoW) that lies within the boundaries of the Duck Lake Indian Reserve (IR) 7 located near the northern limits of Kelowna, BC; specifically, CN Mile 105.9 to 106.6 and Mile 107.0 to 107.5. The subject lands are herein collectively referred to as the "Site" and a Site Location Plan is attached as Figure 1. This Human Health and Ecological Risk Assessment follows a Phase II Environmental Site Assessment (ESA) and a Phase III ESA completed for the Site by Tetra Tech in 2016 and 2017. Tetra Tech understands that these assessments were commissioned to determine the environmental condition of the Site prior to the land being transferred to the Federal Crown.

The methodology used is consistent with Canadian Council of Ministers of the Environment (CCME) guidance, Federal Contaminated Sites Action Plan (FCSAP) guidance and guidance from the government of British Columbia, and represents a conservative estimate of risks associated with potential exposures.

2.0 BACKGROUND INFORMATION

2.1 Site Description

The rails have been removed and the ties lifted from the RoW. The rail bed remains gravel surfaced and the areas along each side of the rail bed are sparsely vegetated.

A site plan is provided as Figure 2. The global positions of the approximate centres of the two sections of the Site are:

- Mile 105.9 to 106.6
  - -Latitude: 50° 0'49.52"N
  - Longitude: 119°23'46.12"W
- Mile 107.0 to 107.5
  - Latitude: 50° 0'8.43"N
  - Longitude: 119°23'15.62"W

Duck Lake IR 7 is located on each side of both sections of the RoW. The RoW bisects the Reserve from the approximate centre of the northern portion to the southeast corner of the northern portion; and runs along the east side of Ellison Lake (locally known as Duck Lake) in the southern portion. The northern portion of the Reserve is generally flat, and is surrounded by residential land along the west of the railway, and residential and light industrial land along the east. The southern portion of the Reserve contains a hilly, vacant area east of the RoW, and residential land and Duck Lake west of the RoW.

2.2 Previous Environmental Investigations

Detailed reports of previous environmental investigations can be found in the Phase II ESA (Tetra Tech 2016) and Phase III ESA (Tetra Tech, 2017). Tables containing all soil sampling results from the 2016 and 2017 field activity and figures showing sampling locations can be found in Appendix A. Soil sample location plans are also provided in Appendix A.

The Phase II ESA found that concentrations of the following substances exceeded the Canadian Council of Ministers Environment (CCME) residential land (RL), park land (PL), and commercial land (CL) guidelines in surface soil samples collected along former rail bed within the Site:

Substance	CCME Guideline Exceeded
Copper	CCME RL/PL and CL Guidelines
Naphthalene	CCME RL/PL and CL Guidelines
Phenanthrene	CCME RL/PL and CL Guidelines
Benzo(b)fluoranthene	CCME RL/PL Guideline
Benzo(k)fluoranthene	CCME RL/PL Guideline
Indeno(1,2,3-c,d)pyrene	CCME RL/PL Guideline
Benzo(a)pyrene Total Potency Equivalent	CCME RL/PL and CL Guidelines
Index of Additive Cancer Risk (IACR)	CCME RL/PL and CL Guidelines
Petroleum Hydrocarbon Fraction F3 (PHC F3)	CCME RL/PL Guideline

Evaluating the Phase II ESA results against the British Columbia Contaminated Sites Regulation (CSR 2017) standards, found that only copper, benzo(b)fluoranthene, and indeno(1,2,3-c, d)pyrene exceeded the CSR RL/PL standards at a few surface soil sample locations only. No substance concentrations exceeded the CSR CL standards.

Step-out soil sampling and analysis conducted during the Phase III ESA confirmed that the extent of copper and polycyclic aromatic hydrocarbon (PAH) impacted soil was restricted to the area of rail bed and embankments and within a depth of 0.4m below grade. Copper and PAH concentrations were less than the CCME RL/PL and CL guidelines and CSR RL standards in all soil samples collected beyond the rail bed and embankments but still within the RoW. Tetra Tech concludes that the contaminants of concern have not migrated laterally or vertically from the former location of the rail bed.

2.3 Groundwater Quality Investigation

Prior to completing this Risk Assessment, Tetra Tech monitored the installation of four groundwater monitoring wells (18MW01 to 18MW04) with the Site in March 2018. Groundwater monitoring well locations are shown on Figure B-1. Drilling and well installation methodologies and borehole logs are provided in Appendix C.

Depth to groundwater measurements collected on April 12 and June 6, 2018, found groundwater at depths ranging from approximately 7.5 m to 9.2 m below grade at 18MW01, 18MW02, and 18MW04. At 18MW03, the depth to groundwater below grade was 1.28 m in April and 1.69 m in June. The groundwater elevation at this location is likely influenced by a creek that passes through this area before discharging to Duck Lake. Flooding has reportedly occurred at this location in the past. Depth to groundwater measurements collected by Tetra Tech are summarized in Table B-1.

BC MoE Observation Well No. 356 is believed to be located on the Property based on the Provincial Groundwater Observation Well Network mapping. Water level measurements collected from Observation Well No. 356 between 2005 and 2015 indicated the groundwater table typically fluctuated less than 1 m over this period. The groundwater level data chart for this observation well is attached in Appendix B. Tetra Tech concludes there are not significant seasonal fluctuations in the groundwater level beneath the Site.

Groundwater samples were collected from 18MW01 to 18MW04 in April and June 2018, and analyzed for dissolved copper and PAHs. The groundwater sampling methodology is provided in Appendix C. The analytical results are summarized in Tables C-2 and C-3 with comparison to the Federal Interim Groundwater Quality Guidelines (FIGQG)

for Residential/Parkland Land Use (2016) for the protection of aquatic life, Guidelines for Canadian Drinking Water Quality (2017) and the BC CSR Generic Numerical Water Standards for the protection of aquatic life and drinking water. Groundwater quality within 10 m of surface water body is to be compared with the CCME Canadian Water Quality Guidelines (CWQG). For the contaminants of potential environmental concern at this Site, the CWQG are the same as the FIGQG.

PAH concentrations in the collected groundwater samples were less than the FIGQG for aquatic life, Health Canada drinking water guidelines and CSR aquatic life standards referenced in these documents. However, the concentration of PAH parameter dibenz(a,h)anthracene (0.017 µg/L did exceed the CSR drinking water standard of 0.01 µg/L in the duplicate groundwater sample from 18MW01 in June. The dibenz(a,h)anthracene concentration in the original June sample from 18MW01 and in all other original and duplicate samples collected in April and June were less than the CSR drinking water standard. Dibenz(a,h)anthracene was not identified as a contaminant of concern in soil samples collected from the Site. Tetra Tech concludes that dibenz(a,h)anthracene is not a contaminant of concern in groundwater beneath the Site.

Dissolved copper concentrations were less than the Health Canada drinking water guideline in all collected groundwater samples and less than the FIGWQ guidelines for protection of freshwater aquatic life in seven of the eight samples collected. While the April groundwater sample collected from monitoring well 18MW01 had a copper concentration less than the FIGQG for aquatic life, the June sample copper concentration exceeded. This single result is not suspected to be attributable to historical railway activities based on the other seven groundwater analytical results and non-detectable copper leachate concentrations obtained from leachate analyses conducted on copper impacted soil during the Phase III ESA. Further, it is noted that monitoring well 18MW01 is located more than 500 m away from Duck Lake and groundwater quality at this location is unlikely to adversely impact aquatic receptors in Duck Lake. In accordance with the Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites the protection of freshwater aquatic life can be excluded from consideration if dissolved phase contaminants are beyond 500 m of a downgradient surface water body.

Groundwater quality data collected by BC MoE from Observation Well No. 356 in 2014 and 2016 also showed dissolved copper concentrations less than the aquatic life and drinking water guidelines and standards and similar to those measured by Tetra Tech.

2.4 Scope of the Risk Assessment

The risk assessment presented for this Site consists of a problem formulation, screening of contaminants of potential concern (COPCs) against residential/parkland and commercial guidelines and standards, and quantitative risk assessment of COPCs retained after screening. The risk assessment was completed to assess the risks to human health and ecological receptors associated with the Site using the 2016 and 2017 analytical results for soil samples and the information provided in the 2017 Phase III ESA, prepared by Tetra Tech. As directed by OKIB, INAC and CN, this detailed quantitative risk assessment provides site-specific estimates of risk for receptors who may use the RoW for the following scenarios:

- Scenario No. 1: The Site is developed into a recreational trail and Federal soil and groundwater quality guidelines are applied. Details pertaining to the proposed construction of the recreational trail are provided in Appendix C.
- Scenario No. 2: The Site is developed into a recreational trail and Provincial soil and groundwater quality standards are applied.
- Scenario No. 3: The Site is used for industrial purposes and Federal soil and groundwater quality guidelines are applied.

A fourth scenario involving industrial use under Provincial soil and groundwater quality standards was considered; however, since none of the soil analytical results exceeded the BC CSR industrial land use soil quality standards, a risk assessment for this scenario is not required.

Potential ecological exposures are evaluated as well, and potential exposure through migration to groundwater and surface water are discussed.

It is not expected that the Site will be desirable to ecological receptors. First, the Site was used as a rail line for several decades and as such, soil compaction has occurred; this will discourage if not prevent plant growth and decrease populations of larger soil invertebrates. Second, given historical use, the RoW is not a grazing area, nor does it provide suitable nesting areas for most ecological receptors. Third, the area around the rail line has been developed for residential and commercial/industrial purposes. It does not present a desirable habitat for most higher-order ecological receptors as there are less developed, more natural areas nearby that are less impacted by human activity. Last, a proposed future use Site is a recreational trail, which would be maintained to allow hiking and biking; this will also limit the desirability of the strip of land for ecological receptors as would any commercial/industrial land uses. Nonetheless, ecological receptors were considered in the screening of COPCs.

3.0 REGULATORY GUIDELINES AND STANDARDS

The risk assessment scenarios consider both Federal environmental guidelines and provincial Contaminated Sites Regulation standards.

The analytical data collected during the Phase II and Phase III ESA's and the 2018 Groundwater Quality investigation were compared to generic numerical guidelines provided by the following documents:

- CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CSQG).
- CCME Canada Wide Standards for Petroleum Hydrocarbons (PHC) in Soil.
- CCME Canadian Water Quality Guidelines for Protection of Aquatic Life.
- Federal Contaminated Sites Action Plan (FCSAP) Federal Interim Groundwater Quality Guidelines (FIGQG).
- Health Canada Guidelines for Drinking Water Quality.
- BC Contaminated Sites Regulation Numerical Soil and Groundwater Standards.

3.1 Soil Quality Guidelines and Standards

CCME guidelines and CSR generic numerical standards were derived to protect human and ecological receptors based on generic scenarios developed for agricultural, residential/parkland, commercial, and industrial land uses.

For potential use of the Site as a recreational trail, RL/PL guidelines and standards are applicable. Therefore, the assessment of risk associated with recreational use of the Site also incidentally assesses the risk associated with residential use of the Site.

If the Site were to be used for industrial purposes, then industrial land use (IL) guidelines and standards are applied. It is noted that industrial use guidelines and standards are equivalent to commercial land use (CL) guidelines and standards for the potential contaminants of concern investigated. CL standards are therefore referenced interchangeably with industrial standards in this report.

In addition to land use, the following additional factors are considered when selecting CCME numerical soil quality guidelines:

- CCME guidelines for petroleum hydrocarbons include differing standards for fine and coarse-grained soil. “Coarse” means coarse-textured soil having a median grain size of > 75 µm and “Fine” means fine-textured soil having a median grain size of ≤ 75 µm; as defined by the American Society for Testing Materials. Based on visual observations of the material logged during testpitting and borehole drilling, the soil analytical results were compared to the more conservative guidelines for coarse grained soils.
- For PAHs naphthalene and phenanthrene, the CCME provides the option of applying either a guideline protective of aquatic life, or an alternative guideline if impact to freshwater surface water is not a concern. Based on the presence of Duck Lake, Tetra Tech determined it was appropriate to assess PAHs against the freshwater aquatic life protective guidelines.
- Two types of human health guidelines are provided for PAHs. Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) is a calculated value protective of direct contact with contaminated soil. The B[a]P TPE guideline selected for this project was based on an incremental lifetime cancer risk of 1 in 100,000 (10-5). This is consistent with risk-based standards applied provincially.
- The second human health guideline for PAHs is the Index of Additive Cancer Risk (IACR) which is protective of potable water resources. The Federal Interim Water Quality Guidelines defers to provincial guidelines for the requirement to protect groundwater for current or future use as potable water source. BC MoE and Climate Change Strategy Protocol 21 for Contaminated Sites: Water Use Determination (November 2017), indicates that standards protective of drinking water apply to a site if a drinking water supply is currently within 500 m of the site or if the aquifer underlying the site is suitable to supply drinking water based on the aquifer’s hydraulic conductivity, yield and water potability. As the BC MoE has mapped an aquifer beneath the Site that can potentially be a potable water source, Tetra Tech infers that guidelines and standards protective of potable water are applicable to the Site.

The CSR also provides Matrix Numerical Soil Standards for the assessment and remediation of soils. Matrix standards are risk-based standards that depend on land use and also a number of site-specific factors. The following CSR Matric Numerical Soil-Specific Factors are considered potentially applicable to the Site:

- Intake of contaminated soil.
- Toxicity to soil invertebrates and plants.
- Groundwater flow to surface water used by aquatic life.
- Groundwater used as drinking water.

3.2 Water Quality Guidelines and Standards

The FIGQG provide guidance on the application of federal standards to groundwater and receiving waterbodies. For groundwater greater than 10 m from a surface waterbody, the FIGQG will apply. For groundwater within 10 m of a surface waterbody, the Canadian Water Quality Guidelines for the Protection of Aquatic Life would apply. For the contaminants of concern for this Site, the FIGQG and the Canadian Water Quality Guidelines are equivalent. The FIGQG are issued as Tier 1 and Tier 2 standards. Tier 1 standards are generic numerical standards that may be directly applied to all sites. Tier 2 standards allow consideration of site-specific conditions and exposures, by removing exposure pathways that are not complete for the site of interest. Both have been used in this assessment, as Tier 1 standards are used as a first step in the screening process.

FIGQG also includes differing standards for fine and coarse-grained soil. As discussed above Tetra Tech has applied guidelines based on the presence of coarse-grained soil.

The FIGQG Tier 2 Guidelines contain standards for specific to water use, receptors, or exposure pathways. Tetra Tech has applied the most stringent of the Tier 2 Guidelines protective of Soil Organisms Direct Contact and Freshwater Life. For this Site, the most stringent FIGQG were the protection of freshwater aquatic life.

The FIGQG also provides guidance on the application of the Guidelines for Canadian Drinking Water Quality (GCDWQ). The GCDWQ are to be applied to protect potable water sources; while the guidelines are intended to be applied at the point of exposure (i.e., tap) the FIGQG recommend they be used when investigating groundwater that could be used as a drinking water source. The determination of a particular aquifer as a potable water source is under provincial jurisdiction. As discussed above, Tetra Tech has determined that drinking water guidelines should apply to the Site.

Similarly, CSR Generic Numerical Water Standards protective of freshwater aquatic life and drinking water have been applied to the analytical data collected from the Site.

4.0 IDENTIFICATION OF CONTAMINANTS OF POTENTIAL CONCERN

Those substances (specifically copper, PAHs, and PHC F3) whose maximum measured concentrations exceeded the CCME RL/PL and CL guidelines, or CSR RL/PL and CL numerical standards were then carried forward for further screening, specific to human or ecological receptors, to determine if pathways are complete and then to evaluate risks.

Data was summarized, providing minimum, maximum, frequency of detection, average concentrations, and the calculated 95th percent upper confidence limit of the mean (95UCL) concentration for each contaminant of potential concern (COPC). The 95UCL is used as the exposure concentration rather than the maximum detected concentration in the calculation of risk. For this assessment, all soil samples collected from the Site and analyzed were used. If duplicate samples were available, the higher of the original or duplicate analytical result was used for each analyte.

4.1 Contaminants of Potential Concern – Soil

Table 4-1 presents the maximum detected concentration of each metal detected in soil in the 2016 and 2017 sampling efforts. Table 4-2 presents the same information for PHCs and PAHs. Sample-specific results are included in Appendix B. Note that chemicals were retained as a COPC if they exceeded any of the guideline screening values. However, in the Phase II ESA, it was established that chromium, nickel, and zinc in soil were not contaminants of potential concern based on statistical analysis in accordance with MOE Technical Guidance 2 For Contaminated Sites; Statistical Criteria for Characterizing a Volume of Contaminated Material (January 2009), and they have not been carried forward in the risk assessment.

Table 4-1 COPC Selection for Metals in Soil

Chemical	Frequency of Detection	Maximum Detected Value (ug/g)	CCME RL	CSR RL	CCME - CL	CSR CL	COPC
Antimony	132/193	2.3	20	20	40	40	No
Arsenic	193/193	8.6	12	15 [#1]	12	15 [#1]	No
Barium	193/193	311	500	400 [#1]	2000	400 [#1]	No

Chemical	Frequency of Detection	Maximum Detected Value (ug/g)	CCME RL	CSR RL	CCME - CL	CSR CL	COPC
Beryllium	193/193	1.2	4	4	8	8	No
Boron	26/193	6	-	-	-	-	No
Cadmium	193/193	0.69	10	3 #1,2	22	25 #1,2	No
Chromium	193/193	78.5	64	60 #1	87	60 #1	**No (#3)**
Cobalt	193/193	24.8	50	50	300	300	No
Copper	193/193	239	63	150 #1,2	91	250 #1,2	**Yes**
Lead	193/193	49.7	140	400 #1,2	260	700 #1,2	No
Lithium	193/193	37.7	-	1600 #3	-	20,000	No
Manganese	193/193	882	-	1800 #3	-	19,000	No
Mercury	15/193	0.83	6.6	15 #1	24	40 #1	No
Molybdenum	193/193	5.5	10	10	40	40	No
Nickel	193/193	69.7	45	100	89	500	**No (#3)**
Selenium	24/193	0.72	1	3	2.9	10	No
Silver	24/193	0.3	20	20	40	40	No
Strontium	193/193	94.2	-	47,000 #3	-	100,000	No
Thallium	118/193	0.4	1	-	1	-	No
Tin	193/193	5.6	50	50	300	300	No
Uranium	193/193	3.83	23	16 #3	33	200	No
Vanadium	193/193	93.5	130	200	130	-	No
Zinc	193/193	506	200	450 #1,2	360	600 #1,2	**No (#3)**

NOTES:

#1 CSR Schedule 5 Matrix Numerical Soil Standard

#2 Standard is Ph dependent. Values shown based on a pH of 7.9

#3 Previously found in Phase II ESA to be not a COPC based on MoE Technical Guidance 2 for Contaminated Sites

- No guideline/standard exists

Table 4-2. COPC Selection for PHCs and PAHs in Soil

Parameter	Frequency of Detection	CCME - Residential/ Parkland	CCME - Commercial	CSR – RL/PL	CSR - CL	Maximum	COPC
2-methylnaphthalene	33/182	[18] #2	-	-	-	0.53	No
Acenaphthene	33/182	0.28	0.28	-	-	0.073	No
Acenaphthylene	64/182	320	320	-	-	1.07	No
Anthracene	84/182	2.5	32	-	-	1.43	No
Benz(a)anthracene	65/182	1	10	1	10	0.677	No
Benzo(a)pyrene	73/182	20	72	5	10 #1	1.3	**No**
Benzo(b)fluoranthene	85/182	1	10	1	10	2.52	**Yes**
Benzo(g,h,i)perylene	76/182	-	-	-	-	16.2	**Yes (#1)**

Parameter	Frequency of Detection	CCME - Residential/ Parkland	CCME - Commercial	CSR – RL/PL	CSR - CL	Maximum	COPC
Benzo(k)fluoranthene	69/182	1	10	1	10	1.14	**Yes**
Chrysene	75/182	[110] [#2]	-	-	-	1.72	No
Dibenz(a,h)anthracene	66/182	1	10	1	10	0.302	No
Fluoranthene	80/182	50	180	-	-	1.68	No
Fluorene	32/182	0.25	0.25	-	-	0.19	No
Indeno(1,2,3-c,d)pyrene	70/182	1	10	1	10	3.54	**Yes**
Naphthalene	36/182	0.013	0.013	5	50	0.271	**Yes**
Phenanthrene	49/182	0.046	0.046	5	50	0.864	**Yes**
Pyrene	67/182	10	100	10	100	1.72	No
B(a)P Total Potency Equivalent		5.3	5.3	-	-	1.09	No
B[a]P TPE multiplied by 3*		5.3	5.3			6.93	**Yes**
IACR (CCME)		1	1	-	-	31.6	**Yes**
Petroleum Hydrocarbons							
F3	22/158	300	1700	-	-	988	**Yes**
F4	2/158	2800	3300	-	-	241	No

Note: [#1] Retained for further evaluation as a screening guideline is not available

Of the suite of metal parameters analyzed in soil during the Phase II and Phase III ESA's only copper concentrations exceeded the numerical soil quality guidelines and standards. Copper at a maximum concentration of 239 ug/g exceeded CCME residential/parkland screening guideline of 63 ug/g; the CSR residential/parkland numerical standard of 150 ug/g; and the CCME commercial land screening guideline of 91 ug/g. The CCME guidelines are based on the direct soil contact by invertebrates. The human health based CCME soil guidelines are 1,100 ug/g for residential/parkland and 4,000 ug/g for commercial lands. Therefore, copper, is further evaluated for risk to ecological receptors but not for human health risk.

Of the suite of PAH parameters analyzed in soil during the Phase II and Phase III ESAs, only concentrations of benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-c,d)pyrene, naphthalene, and phenanthrene exceeded the numerical soil quality guidelines and standards. Benzo(a)pyrene and benzo(g,h,i)perylene were also retained as COPCs for the risk assessment as these parameters are included in the B(a)P TPE and IACR calculated values, which also exceeded the CCME numerical guideline. Each PAH COPC is discussed below.

- **Benzo(b)fluoranthene** at a maximum concentration of 2.52 ug/g exceeded CCME guideline and CSR numerical soil quality standard of 1 ug/g. The human health-based CSR numerical standard is 50 ug/g, and based on this concentration benzo(b)fluoranthene is not of concern to humans. However, it was retained to estimate the risk posed by the B(a)P TPE and IACR calculated values. The maximum concentration exceeded the ecological screening value and, therefore, was retained as an ecological COPC, as well.

- **Benzo(g,h,i)perylene** was detected at a maximum concentration of 16.2 ug/g. There are no CCME and CSR screening values for this PAH, so it was retained for further evaluation. While there is no human health-based CCME guideline or CSR standard for benzo(g,h,i)perylene, the toxicity equivalency value listed in CCME 2010 is 0.01, which denotes the toxicity of benzo(g,h,i)perylene relative to benzo(a)pyrene. Therefore, the CSR soil quality guideline value for benzo(a)pyrene of 5 ug/g was adjusted for toxicity and a value of 500 ug/g was used for the screening of benzo(g,h,i)perylene. As the maximum concentration for benzo(g,h,i)perylene is far below this guideline, it is unlikely to pose a threat to human health. However, it was retained for an evaluation of risk posed by the B(a)P TPE and IACR calculated values. It was also retained for further evaluation in the ecological risk assessment.

- **Benzo(k)fluoranthene** at a maximum concentration of 1.14 ug/g marginally exceeded the CCME guideline and CSR numerical standard of 1 ug/g. This standard is based on ecological receptors. The CSR numerical standard for human health is 50 ug/g, and based on this value, benzo(b)fluoranthene is not a concern in the human health risk assessment. However, it was retained in the human health risk assessment for evaluation of risk posed by the B(a)P TPE and IACR calculated values. It was also retained in the ecological risk assessment for further evaluation.

- **Indeno (1,2,3-c,d) pyrene** at a maximum concentration of 3.54 ug/g exceeds the CSR numerical standard of 1 ug/g. This value is based on ecological receptors. The CSR numerical standard for human health is 50 ug/g, and based on this value, indeno(1,2,3-c,d)pyrene is not a concern in the human health risk assessment. However, it was retained in the human health risk assessment for evaluation of risks posed by the B(a)P TPE and IACR calculated values. It was also retained in the ecological risk assessment for further evaluation.

- **Naphthalene** – The maximum concentration of 0.271 ug/g exceeds the CCME guideline of 0.013 ug/g, which is based on the protection of freshwater life. However, there has been no detection of naphthalene in groundwater (discussed in the Section 3.2). Further, naphthalene was detected in only 36 out of 182 samples, indicating only localized surficial impacts over the entire length of the Site. Based on a lack of complete exposure pathway, the maximum concentration of naphthalene was compared to guidelines for soil and food ingestion pathways for ecological receptors of 8.8 ug/g (CCME 2008a) as no direct contact guideline for naphthalene is listed in CCME 2008a. As naphthalene is below this guideline, it was not retained as a COPC for ecological receptors. No human health guideline is available for naphthalene from CCME 2008a. Instead, a soil screening value of 11 ug/g (calculating using residential exposure values and toxicity values from Health Canada) was used to evaluate the potential for human impacts; as the maximum value was below this, naphthalene was not retained as a COPC for human health risks. Naphthalene concentrations in soil, therefore, do not pose an unacceptable risk for RL/PL and CL land uses.

- **Phenanthrene** – The maximum concentration of 0.414 ug/g exceeds the CCME guideline of 0.046 ug/g, which is based on the protection of freshwater life. However, there has been no detection of phenanthrene in groundwater (discussed in the Section 3.2). Further, phenanthrene was detected in only 49 out of 182 samples, indicating only localized surficial impacts over the entire length of the Site. Based on a lack of complete exposure pathway, the maximum concentration of phenanthrene was compared to guidelines for soil and food ingestion pathways for ecological receptors of 43.3 ug/g (CCME 2008a) as no direct contact guideline for phenanthrene is listed in CCME 2008a. As phenanthrene is below this guideline, it was not retained as a COPC for ecological receptors. No human health guideline is available for phenanthrene from CCME 2008a. Instead, a soil screening value calculated for residential exposures and toxicity values from Health Canada of 120 ug/g was used to evaluate the potential for human impacts; as the maximum value was below this, phenanthrene was not retained as a COPC for human health risks. Phenanthrene concentrations in soil, therefore, do not pose an unacceptable risk for RL/PL and CL land uses.

Therefore, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-c,d) were retained for both the human health and ecological risk assessments.

The comparison of petroleum hydrocarbon detected values against the CCME screening values indicated that the maximum concentration of F3 was above residential/parkland screening levels. F2 was not detected, and F4 was detected only twice, at concentrations well below screening values. F3 was further evaluated.

- F3: The soil quality guideline of 300 mg/kg is based on direct contact of soil invertebrates and plants to F3. Out of 158 samples, PHC F3 was detected 22 times. Twelve of the 22 detected concentrations were above 300 mg/kg. Eleven of the detects were in the first 0.15 m soil depth and one was detected at 0.4 m. The data show that F3 is not migrating beyond a shallow depth. Given the localized nature of these detection, that the screening value is based on a decrease of soil invertebrates or plants at the population level, and that an average concentration would be far below the 300 mg/kg value, F3 was not retained as an ecological COPC. In addition, the human health-based guideline (residential land use) for PHC F3 is 15,000 mg/kg. The maximum detected F3 concentration is 988 mg/kg, far below the human health-based standard, and F3 was eliminated from further consideration in the human health risk assessment.

Table 4-3 presents the data summary of COPCs remaining after the screening of soil samples from 0 to 0.7 m depth interval collected in for the Phase II and Phase III ESAs in 2016 and 2017 from the length of the RoW within the Site. Minimum and maximum concentrations are shown, along with detection frequency and the mean of detected values. The data distribution was determined using ProUCL, which also produced a 95 UCL concentration that is used as an exposure concentration.

Table 4-3: Data Summary for COPCs in Surface Soil (0 – 0.7 m bgs)

Chemical	Minimum Concentration (ug/g)	Maximum Concentration (ug/g)	Frequency of Detection	Mean of Detects	95UCL	Distribution
Metals						
Copper	6.9	239	193/193	48.8	63.2	Not Discernable
Polycyclic aromatic hydrocarbons						
Chemical	**Minimum Concentration (ug/g)**	**Maximum Concentration (ug/g)**	**Frequency of Detection**	**Mean of Detects**	**95UCL**	**Distribution**
Benzo(a) pyrene	0.01	1.3	73/182	0.288	0.118	Lognormal
Benzo(b)fluoranthene	0.01	2.52	85/182	0.452	0.284	Gamma
Benzo(g,h,i) Perylene	0.021	16.2	76/182	1.765	0.881	Lognormal
Benzo(k) fluoranthene	0.011	1.14	69/182	0.234	0.122	Gamma
Indeno(1,2,3-c,d)pyrene	0.021	3.54	70/182	0.64	0.345	Gamma

4.2 Contaminants of Potential Concern - Groundwater

The following table includes the chemicals whose maximum concentrations exceeded the WQG as shown in Table 4-4. Four groundwater wells were installed, and the following samples were collected in April 2018. The samples were analyzed for copper and PAHs. Only copper and dibenzo(a,h)anthracene were detected, as shown below. Analytical results for groundwater are included in Appendix C.

Table 4-4. Groundwater Data

COPC	Frequency of Detection	Minimum Concentration	Maximum Concentration	Guideline Concentration	Guideline Source/Pathway	COPC?
Copper	8/8	0.00042 mg/L	0.00522 mg/L	0.002 mg/L	FIGQG for Freshwater Aquatic Life	No – As discussed below
Dibenzo(a,h) anthracene	1/4	0.017 ug/L	0.017 ug/L	0.26 ug/L	FIGQG for Freshwater Aquatic Life	No

Only one of the eight collected groundwater samples exceeded the FIGQG for freshwater aquatic life and this single sample was collected from groundwater monitoring well 18MW01 located more than 500 m upgradient of Duck Lake. As discussed in Section 2.3 this single result is not suspected to be attributable to historical rail way activities. In accordance with the Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites the protection of freshwater aquatic life can be excluded from consideration if dissolved phase contaminants are greater than 500 m away from a downgradient surface water body. Therefore, copper in groundwater is not considered to be a contaminant of potential concern.

The measured dissolved copper concentrations were also below the Health Canada Guideline for Drinking Water. Health Canada does not provide a drinking water guideline for Dibenzo(a,h)anthracene.

Tetra Tech concludes there are no COPCs in groundwater.

4.3 Other Environmental Media

Based on site history, samples collected for characterization and potential site reuse, it was determined that only soil and groundwater were media of concern. Soil vapour and indoor air are not media of concern because there are no volatile components for COPCs and no potentially complete exposure pathways; therefore, no samples were collected during this investigation for these media. Similarly, no fish tissue, plants, or wild game samples were collected as these pathways are not complete for this Site.

5.0 HUMAN HEALTH RISK ASSESSMENT

In Canada, risk assessment has been accepted by provincial and federal governments as a valid method to guide management decisions. The risk assessment methods for this assessment were based on the following guidance documents:

- British Columbia Ministry of Environment and Climate Change Strategy (BC MoE) Protocol 13 for Contaminated Sites: Screening Level Risk Assessment, Version 3, November 1, 2017.
- BC MoE Technical Guidance 7 for Contaminated Sites: Supplemental Guidance for Risk Assessment, Version 5.0, November 2017.
- BC MoE Technical Bulletin 2: Requirements for Human Health and Ecological Risk Assessments, September 15, 2015.
- Health Canada. 2010, updated 2012. Federal Contaminated Site Risk Assessment in Canada Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA).

- Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada Part II: Health Canada Toxicological Reference Values (TRVs).
- Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals.
- Health Canada. 2011. Federal Contaminated Site Risk Assessment in Canada Supplemental Guidance: Checklist for Peer Review of Detailed Human Health Risk Assessments (HHRA).

5.1 Problem Formulation

The purpose of the Problem Formulation component is to identify the chemicals, receptors, and exposure pathways that are applicable for the Site. The COPCs were identified above; however, further refinement of the COPCs was completed to focus on parameters that are most applicable to the individual human health risk assessments for the potential future use scenarios of a hiking/biking trail or industrial land use.

The objective of the exposure pathway identification is to determine all the potential routes by which human receptors could be exposed to COPCs in contaminated media from the Site. The results of the Problem Formulation phase are summarized in the development of a conceptual site model (CSM) that depicts the exposure pathways and receptors.

Humans potentially impacted by the COPCs were identified under the proposed land uses. It is noted that use of the RoW in winter months as a path for snowmobiles could be possible. However, snow cover and cold-weather clothing would prevent contact with surface soils. Therefore, direct exposure to the RoW is assumed to likely to occur for 9 months per year rather than 12 months.

Table 5-1. Potential Receptors

Receptor	Age Group	Rationale
Worker	Adult (20+ years)	▪ Industrial use of the land is possible. Generally, workers are assumed to be adults only with an exposure time of 8 hours/day and 250 days/year for 35 years.
Recreational Trail Users	Adult (20+ years) Teen (12 -19 years) Child (5 - 11 years) Toddler (7 months to 4 years)	▪ Recreational visitors to the RoW are expected to spend no more than an hour at the site while passing through, walking or biking and may not have daily or long-term exposures; this would occur for up to 9 months per year due to snow cover or weather conditions.

5.2 Exposure Pathway Identification for Human Health

An exposure pathway is a mechanism by which a human receptor is exposed to chemicals from a source. Several possible exposure pathways may exist at a site. The following four elements constitute a complete exposure pathway:

- A source and mechanism of chemical release;
- A retention or transport medium;
- A point of potential receptor contact with the affected medium; and
- A means of entry into the body at the contact point.

Complete pathways represent situations where there is potential for receptors to be exposed to contaminants. Incomplete pathways represent situations where exposure or contact with the contaminant is unlikely to occur, therefore, risk to the receptor is negligible.

The CCME guidelines contain site-specific factors for soil. The possible site-specific factors for residential/parkland land use are as follows: direct contact (ingestion and dermal contact), vapour inhalation, protection of potable groundwater, protection of groundwater for aquatic life, ecological soil and food ingestion, nutrient cycling, ecological soil contact, and management limits. Nutrient cycling is indicated as “not calculated’ in CCME and, therefore, guidelines were not available at this time.

Of the pathways presented in the CCME soil guidelines, the human exposure pathways at the site are identified as complete or incomplete below.

5.2.1.1 Human Health – Soil Ingestion and Dermal Contact

Soil ingestion and dermal contact exceedance exist at the site for COPCs at or near the surface. People accessing the site currently or in the future may potentially be exposed to soil impacts. This exposure pathway would also be applicable for workers who could bring soil to surface. As such, this pathway is considered to be complete and was evaluated in this assessment.

5.2.1.2 Human Health – Vapour Inhalation

Subsurface vapours may migrate though soils and infiltrate into buildings (referred to as vapour intrusion) at distances up to 30 m from the PHC source (HC 2012). However, there are no buildings on the site and there were no volatile chemicals detected in surface soil. Therefore, this exposure pathway is considered incomplete and not further evaluated.

5.2.1.3 Human Health – Inhalation of Particulate Matter

Soil particles suspended in (outdoor) air would be expected to be inhaled by any people present on the Site. As such, this pathway is considered to be complete and was evaluated in this assessment.

5.2.1.4 Human Health – Drinking Water

The groundwater ingestion pathway is typically considered applicable if a Site is underlain by a potential domestic use aquifer or is within 500 m of a potential domestic use aquifer. BC MoE has mapped the underlying aquifer as a potential drinking water use aquifer. This exposure pathway is, therefore, considered potentially complete but drinking water was not further evaluated because there were no detected PAHs or dissolved copper in groundwater samples above drinking water guidelines (see Section 3.2). However, soil COPCs were evaluated as part of the IACR calculation.

5.2.1.5 Consumption of Berries, Plants, or Game

These exposure pathways consider ingestion of berries, plants, or wild game that may have accumulated COPCs from soil into their tissues. As the rail bed and location of impacted soil does not currently support plant growth, collection of berries or plants within the impacted area of the RoW does not occur. In addition, the RoW is not a desirable habitat due to lack of vegetation and previous use that has compacted the soil. It is adjacent to populated areas, and as such, would not be suitable for hunting. Therefore, consumption of berries, plants, and game exposure pathways were not retained for evaluation in the human health risk assessment.

5.2.1.6 Consumption of Fish

This exposure pathway considers consumption of fish that may have accumulated COPCs from surface water or sediment into their tissues. Migration of COPCs from the RoW has not been observed, and groundwater samples collected by Tetra Tech within 500 m of Duck Lake did not contain COPCs above CCME guidelines or CSR standards protective of aquatic life. Consumption of fish was, therefore, not retained for evaluation in the human health risk assessment.

5.2.1.7 Management Limits

As per CCME (2008b), PHC management limits must be applied at all soil depths if the ecological soil contact pathway has been eliminated. The management limit for PHC F3 is 2,500 mg/kg. There are no exceedances of the management limit of PHC F3 in surficial soils. A review of the individual factors considered by CCME in the development of the management limits has been reviewed relative to their applicability to the subject site as described below.

Free phase formation: Free phase PHC formation is undesirable because a free phase acts as a source of future contamination and may result in effects on indoor air quality and potable groundwater. No free-phase products have been identified on the ground surface in the area of the identified PHCs.

Effects on workers in trenches: Potential risks to humans working in trenches may occur since higher vapour infiltration rates occur in trenches compared with surface exposures. CCME (2008b) used a model to predict the influx of contaminant vapours into trenches. Exposure to PHC vapours for workers in trenches is a not concern with respect to the assessment of PHC F3 in soil, and therefore, this pathway is not complete.

Fire and explosive hazards: When PHC vapour concentrations exceed the lower explosive limit, combined with sufficient oxygen and an ignition source, a fire or explosive hazard exists. CCME (2008b) recommends a management limit for F3 of 2,500 mg/kg for coarse-grained soil for residential land use, and 3,500 mg/kg for commercial land use. Given the levels of identified PHC F3 soil impacts, a source of ignition is not likely to produce a fire hazard on this site.

Effects on buried infrastructure: Petroleum hydrocarbons can affect buried infrastructure, including underground utilities. There are no thresholds for F1 to F4 that would be protective of buried infrastructure. PHCs in the surface soils would not be in contact with deep buried utilities at the site, and therefore, have not been included as a pathway. Shallow buried infrastructure is unlikely at this site, given the compacted soil, projected reuse and the existing infrastructure already in place. Therefore, this is not likely a concern.

Aesthetic considerations: Aesthetic considerations at a site include odours, visible impacts on soils, and effects on the taste of potable water (CCME 2008b). PHC-impacted soil at this site is located at depths from surface to 0.4 mbgs. Odours are also not considered a concern due to the location of the identified PHCs in an open exterior environment.

Technological factors (i.e., difficulty of some soils to naturally bioremediate): The primary technological factor to be considered at PHC-impacted sites is the ability for biodegradation to occur, since this is the preferred method for remediating PHC in soils. The management limit for technological factors is driven by the difficulty in developing bioremediation systems for PHCs in the F3 and F4 ranges and the consideration of toxicity of F3 to ecological receptors. Since the PHC F3 impacted areas noted are discrete, small, and well below management limits addressing these technological factors is not considered necessary at the site.

5.3 Results of the Problem Formulation

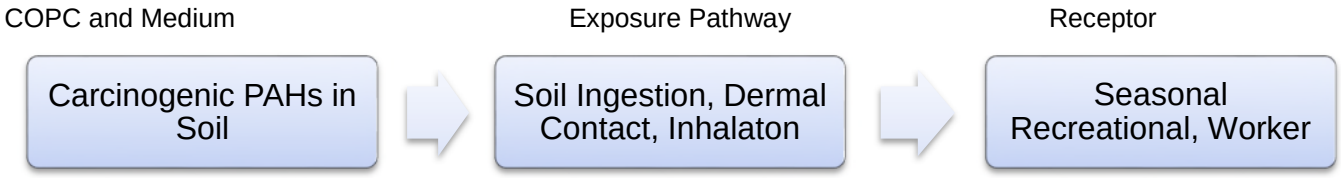
Below is a summary of the Human Health COPCs that remain after the problem formulation.

Table 5-2: Summary of COPCs

Remaining COPCs	Pathway Human Health
Benzo(a)pyrene	Soil Ingestion, Dermal Contact Inhalation as part of the B(a)P TPE
Benzo(b)fluoranthene	Soil Ingestion, Dermal Contact, Inhalation as part of the B(a)P TPE
Benzo(g,h,i)perylene	Soil Ingestion, Dermal Contact Inhalation as part of the B(a)P TPE
Benzo(k)fluoranthene	Soil Ingestion, Dermal Contact Inhalation as part of the B(a)P TPE
Indeno(1,2,3-c,d)pyrene	Soil Ingestion, Dermal Contact Inhalation as part of the B(a)P TPE
IACR	Further evaluation of potential for PAHs in soil to leach to groundwater

5.4 Conceptual Exposure Model

A summary of the contaminant transport mechanisms, potentially impacted media, receptors of concern, COPCs, and potentially complete exposure pathways is presented in a conceptual exposure model shown below. This model applies to both future land use scenarios. Only operable exposure pathways are identified and evaluated further in the risk assessment.



5.5 Exposure Assessment

The exposure assessment provides the exposure point concentration, a description of the likely exposures, and the parameters to be used in the assessment of risk. Each is described below.

5.5.1 Exposure Point Concentrations

The exposure point concentration represents the concentration to which the identified receptors could be exposed under the pathways determined in the problem formulation. COPCs were selected from the most recent two data sets, and for soil, all samples were collected from a depth of 0 mbg to 0.7 mbg. ProUCL v 5.02 (USEPA 2016) was used to summarize the data for each COPC, determine its distribution, and calculate an upper bound concentration (the 95 percent upper confidence limit of the mean, 95UCL) to be used as the exposure point concentration. ProUCL recommends a minimum of 10 discrete sampling results to adequately estimate an exposure point concentration; over 150 samples were available for this Site. The sampling results from both the Phase II ESA and Phase III ESA sampling investigations were combined for the selected COPCs to determine an exposure point concentration for each to be used for risk assessment purposes. In instances where duplicate samples were available, the higher of the original or duplicate sample was used as representative of site conditions, and was included in the calculation of the exposure point concentration. Individual sample results were entered into ProUCL v. 5.02 (USEPA 2016) and the following summary statistics were produced: mean of detected concentration, data distribution, and 95UCL concentration. The ProUCL output data is located in Appendix D.

After the COPC screening, only benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno (1,2,3-c,d) pyrene in soil were retained as potential COPC for the human health

risk assessment. While these components were not found to exceed individual CCME or CSR human health screening values, they were retained to evaluate the BaP TPE and IACR as shown in Tables 5-3 and 5-4, below.

The above PAHs, as well as benzo(a)anthracene, chrysene, and dibenzo(a,h)anthracene were retained to evaluate the IACR. The IACR assesses potential threats to potable groundwater quality from leaching of carcinogenic PAH mixtures from soil. Although groundwater has not been found to have been impacted as measured by sampling gin April and June 2018, this evaluation was conducted to be conservative. The IACR is calculated by dividing the soil concentration (numerator) of each carcinogenic PAH by its soil quality guideline for protection of potable water component value (denominator) to calculate a hazard index for each PAH, and then summing the hazard indices for the entire PAH mixture per CCME guidance (2010). The following equation was used for this calculation:

IACR =

Benzo(a)anthracene/0.33 mg/kg + Benzo(b+ k)fluoranthene/0.16 mg/kg + Benzo(g,h,i)perylene/6.8 mg/kg + benzo(a)pyrene/0.37 mg/kg + Chrysene/2.1 + Dibenzo(a,h)anthracene/.23 + Indeno(1,2,3-c.d)pyrene/2.7 mg/kg

Table 5-3 and 5-4 present the TPA and IACR calculated values, respectively, along with the minimum detected concentration, maximum detected concentration, and frequency of detection for each PAH.

Table 5-3: B(a)P TPE Assessment for Exposure Point Concentrations for Human Health COPCs

Chemical	Minimum (mg/kg)	Maximum (mg/kg)	Frequency of Detection	UCL (1) (mg/kg)	BaP TPE (2)
Benzo(a) pyrene	0.01	1.3	73/182	0.118	0.118
Benzo(b)fluoranthene	0.01	2.52	85/182	0.284	0.0284
Benzo(g,h,i) Perylene	0.021	16.2	76/182	0.881	0.00881
Benzo(k)fluoranthene	0.011	1.14	69/182	0.122	0.0122
Indeno(1,2,3-c,d)pyrene	0.021	3.54	70/182	0.345	0.0345
Benzo(a)anthracene (3)	0.01	0.677	65/182	0.0787	0.00787
				Total BaP TPE	**0.21**

(1) Distribution generated by ProUCL and used by the program to estimate a UCL for use as an exposure point concentration. The listed UCLs are the recommended values from ProUCL.

(2) BaP TPE calculated as (benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(benzo(g,h,i)perylene)(0.01)+(indeno(1,2,3-c,d)pyrene)(0.1)

(3) Benzo(a)anthracene UCL concentration based on gamma distribution as determined by ProUCL

Table 5-4: IACR Assessment for Exposure Point Concentrations for Human Health COPCs

Chemical	Minimum (mg/kg)	Maximum (mg/kg)	Frequency of Detection	UCL (1) (mg/kg)	IACR (2)
Benzo(a) pyrene	0.01	1.3	73/182	0.118	0.32
Benzo(b)fluoranthene	0.01	2.52	85/182	0.284	1.78
Benzo(g,h,i)perylene	0.021	16.2	76/182	0.881	0.13
Benzo(k)fluoranthene	0.011	1.14	69/182	0.122	0.76
Chrysene	0.01	1.72	75/182	0.137	0.065
Dibenzo(a,)anthracene	0.005	0.302	66/182	0.0303	0.13
Indeno(1,2,3-c,d)pyrene	0.021	3.54	70/182	0.345	0.13
Benzo(a)anthracene (3)	0.01	0.677	65/182	0.0787	0.24
				Total IACR	**3.55**

(1) Distribution generated by ProUCL and used by the program to estimate a UCL for use as an exposure point concentration. The listed UCLs are the recommended values from ProUCL.
(2) IACR calculated as [benzo(a)anthracene/0.33 mg/kg +benzo(a)pyrene/ 0.37 mg/kg + benzo(b)fluoranthene/0.16 mg/kg + benzo(k)fluoranthene/0.16 mg/kg + benzo(g,h,i)perylene/6.8 mg/kg + indeno(1,2,3-c,d)pyrene/2.7 mg/kg + chysene/2.1 mg/kg + dibenzo(a,h)anthracene/0.23 mg/kg]
(3) Benzo(a)anthracene, chrysene, and dibenzo(a,h)anthracene UCL concentration based on gamma distribution as determined by ProUCL

5.5.2 Exposure Parameters

As described in the problem formulation, human receptors identified included adult-aged residents, adult-aged workers, or seasonal recreational receptors. The recreational visitor is assumed to range in age from toddler to adult. It is anticipated that each of these receptors would be seasonal and temporary, as the site is planned for use as a recreational trail, but it would also be used by nearby residents more frequently, as well as being accessible to industrial purposes. All receptors were assumed to be present all months of the year and seven days per week, given the accessibility of the area. No adjustments were made for snow cover. The occasional visitor was assumed to be present two days/week for four months (32 days per year), using the trail when it is not snow-covered. Workers were also assumed to be present all year, and exposures are limited to adults only. However, the assessment of residential exposures will be protective of the recreational and industrial receptors, as well, as it assumes a more extensive and longer-term contact with the Site.

In the assessment of risks using the published guideline values, default exposure parameters applicable to residential receptors aged infant through adult are used. These were assumed to apply to the Site and were not changed. The residential assumptions used to assess exposures and estimate risks for this assessment as protective of all potential uses, as they include children, and represent a more extensive contact than either commercial or recreational exposures. The exposure parameters are listed below in Table 5-5.

Table 5-5: Exposure Parameters Appropriate to Site Exposures

Parameter	Adult (20+)	Teen	Child	Toddler
Exposure Time (hours)	8	8	8	8
Exposure Frequency (days)	Worker – 5 Resident – 7 Visitor – 2	7	7	7
Exposure (weeks/year)	Worker – 50 Resident - 52 Visitor – 16	52	52	52
Exposure Duration (years)	Worker – 35 Visitor – 80	80	80	80
Soil ingestion (g/day)	Worker – 0.1 Resident – 0.02 Visitor – 0.02	0.02	0.02	0.08
Body weight (kg)	70.7	59.7	32.9	16.5
Dermal Contact with soil	Hands, arms, and legs	Hands, arms, and legs	Hands, arms, and legs	Hands, arms, and legs
Inhalation rates (m^3/day)	16.6	15.6	14.5	8.3

5.6 Hazard Assessment

The hazard assessment is the process of identifying the relevant and appropriate toxicity values required for evaluating potential human health effects related to predicted exposures to COPCs. It involves identification of the

potentially toxic effects of the COPCs and the determination of the amount of the COPCs that can be taken into the body without experiencing adverse health effects. This evaluation is included as Appendix E for benzo(a)pyrene, which is considered carcinogenic by CCME and against which the relative potencies are established.

5.7 Risk Characterization

In risk characterization, the exposure dose is multiplied by the slope factor to provide a probability estimate of the outcome. For benzo(a)pyrene equivalents, the total potency equivalent is compared to the screening value of 5.3; the ratio of the two values provides an estimate of risk. The following sections describe methods to calculate only carcinogenic risk estimates, as non-carcinogenic parameters were not identified as COPC for the human health risk assessment. In addition, the IACR was calculated and evaluated to determine the potential for PAHs to impact groundwater per CCME guidance (2010).

5.7.1 Benzo(a)pyrene Risk Characterization

Risk estimates for the carcinogenic COPCs were developed by comparing the calculated BaP TPE to the screening value for residential land use. The value is 5.3 BaP TPE (CCME 2010). The following equation was used:

$$\text{Ratio} = \frac{\text{Site-Specific Bap TPE}}{\text{Screening Value for BaP TPE}}$$

The ratio was 0.21/5.3, or 0.04. Using the calculated BaP TPE and multiplying by 3 to account for the source of PAHs being the railroad ties per CCME guidance, the ratio is 0.63/5.3, or 0.12. These ratios are well below 1.0

When the ratio is greater than the 1.0, the scenario poses a potential concern and requires further evaluation or risk management. Here, the ratio is well below 1.0 and provides an adequate margin of certainty for all exposures. This is because of the conservative assumptions used in developing the BaP TPE screening value (residential exposure).

5.7.2 IACR Calculation and Risk Characterization

The IACR calculated using the equation presented in Section 4.5.1. CCME guidance requires this calculation to screen for potential leaching of PAHs from soil to groundwater, to ensure the protection of potable water sources. Table 5-4 contains this calculation, and the sum of all PAHs totaled 3.55, using the 95UCL exposure point concentration for all samples from the site. Benzo(b)fluoranthene had an IACR value above 1, and benzo(f)fluoranthene had a value of 0.76. The screening shows a potential for groundwater impacts. However, groundwater sampling has not detected these PAHs. As well, PAHs were detected only in the top 0.4 m of soil and do not appear to be migrating through soil. Further, site-specific modeling documented in the Phase III ESA report has shown little potential for leaching of PAHs to groundwater. Despite the exceedance of the guideline, site-specific information demonstrates that leaching is not a concern for this Site.

5.7.3 Risk Estimate Results

The concentrations and associated risks from PAHs at this Site are within the acceptable range when based on the 95 UCL concentration for each identified COPC. The calculated BaP TPE is far below the level of concern of 5.3 and the ratio of site to screening level TPE is far below 1.0. CCME guidance recommends that the B(a)P TPE be multiplied by 3 to account for the source of the PAHs and for PAHs that may be present but not detected; this value is 0.06 and is also well below the screening value of 5.3. Therefore, human health impacts are unlikely for this Site.

Further, the IACR was calculated using the 95UCL concentrations to determine a potential for leaching to groundwater. While the IACR total was above 1.0 (the screening value), this was due mainly to

benzo(b)fluoranthene and benzo(k)fluoranthene, neither of which were detected in groundwater samples nor were they often found below 0.4 m bgs. They were located within the railbed and were not detected in embankments or beyond, indicating very little potential for migration. Based on this analysis, it is not expected that PAHs will leach to groundwater and there is no threat to human health.

In addition, the planned reuse will not expose deeper soils, and will not result in exposures more extensive than assumed here. Residential land use is the most extensive exposure assumption for this RoW, and is protective of industrial uses, workers, or recreational exposures.

6.0 ECOLOGICAL RISK ASSESSMENT

The Ecological Risk Assessment was completed to assess risks to ecological receptors associated with soil impacts at the Site. It was completed for the protection of species at risk (SAR) at an individual level and non-SAR at a community/population level. The risk assessment methods for this assessment were based on the following guidance documents:

- Canadian Council of Ministers of the Environment. 1996. A Framework for Ecological Risk Assessment: General Guidance;
- Environment Canada. 2012a. Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance;
- Environment Canada. 2012b. Federal Contaminated Site Action Plan (FCSAP) Supplemental Guidance for Ecological Risk Assessment – Standardization of Wildlife Receptor Characteristics; and
- British Columbia Ministry of Environment, Lands, and Parks. 1998. Protocol #1: Recommended Guidance and Checklist for Tier 1 Ecological Risk Assessment of Contaminated Sites in British Columbia.

6.1 Problem Formulation

The purpose of the Problem Formulation component is to identify how the chemicals, receptors, and exposure pathways interact at the Site. The COPCs were identified above in Section 3.0; however, further refinement of the COPCs was completed to focus on parameters that are most applicable to the ecological risk assessment. Individual pathways included in the guideline derivation for ecological health were reviewed for the current and surrounding land use – residential/parkland for ecological receptors.

Ecological receptors were selected by examining the activities that might occur under residential/parkland land use scenarios.

The objective of the exposure pathway identification is to determine all of the potential routes by which ecological receptors could be exposed to COPCs in contaminated media from the site. The results of the Problem Formulation phase are summarized in the development of a CSM that depicts the exposure pathways and receptors.

6.2 Ecological Receptors

A desktop biological inventory was completed in order to identify what plants and animals would likely be living at or foraging for food at the site, and potentially exposed to contaminated soils, groundwater and/or surface water at the site, using information from the British Columbia Ministry of Forests (1991). The results of this assessment are presented below. A basic summary of the plants and animals that may be present at the site is contained in the following paragraphs.

While there are many ecological species that could be present in a site setting, it is not practical to evaluate all species. Risk assessments must limit their focus on only some of the specific animals that might use a site. Representative receptors selected for the risk assessment are those that have the greatest potential for exposure, that play a key role in the food web, and that have sufficient characterization data to facilitate calculations of exposure and health risks. A receptor of concern is generally a single species which serves a surrogate for the other related species. The following criteria from CCME (1996) and Environment Canada (EC) (2012a, 2012b) were used to select the receptors evaluated in the risk assessment:

- Potentially sensitive to the substances identified at a site;
- Known or expected habitat of animals recognized by the government as threatened or endangered or of special concern;
- Year-round residents at a site;
- Migratory birds, where a significant proportion of the population is concentrated in the vicinity of a site during certain periods;
- Dominant within local biological communities, or functioning as keystone species within nearby ecosystems;
- Recognized as good indicators or surrogate species (i.e., representative of other similar organisms of a general type and feeding niche);
- Of aesthetic value or of value to the local human population; or
- Of recreational importance.

6.2.1 General Ecozone Evaluation

The Site is located in the Interior Plateau Region of British Columbia, specifically the Thompson-Okanagan Plateau. This ecozone encompasses the area of Kelowna, Kamloops, and Penticton. It is identified as the Interior Douglas-fir (IDF) zone with a continental climate characterized by warm, dry summers and cool winters. The land is characterized by rolling plateaus and major valley systems of the Okanagan, Thompson, and Nicola Rivers. The mean annual temperature of the IDF zone is approximately1 6°C to 9.5°C. The mean annual precipitation ranges 300 mm to 750 mm, and over 1000 mm in the wettest areas.

Vegetation in the zone is characterized by spruce, subalpine fir, and ponderosa pine while lower elevations are characterized by forests of ponderosa pine with grass understory, mixed with aspen, white spruce, and Douglas fir. Valley bottoms support open stands of Douglas fir, pine grass, ponderosa pine, as well as bluebunch wheatgrass and sagebrush. BC MoE classifies the region as Interior-Douglas fir with Montane spruce areas.

The range of wildlife in the Thompson-Okanagan Plateau is varied, and includes California big horn sheep, mule and white-tailed deer, elk, black bear, coyote, bobcat, cougar, wolverine, blue grouse, and waterfowl. Large carnivores include black and grizzly bear, bobcat, and cougar. Small predators include the coyote, badger and wolverine. The smaller herbivores include the golden-mantled ground squirrel northern pocket gopher, yellow-bellied marmot, southern red-backed vole, and red squirrel (BCMoF 1991, BCMoE 2018).

Reptiles and amphibians that may be present include the rubber boa, western rattlesnake, pacific tree frog, and the tiger salamander (in riparian areas) (BCMoF 1991, BCMoE 2018).

Some of the birds of prey in this area are the broadwinged hawk, Swainson's hawk, common nighthawk, and various owls. Waterfowl are the pacific, and red-throated loons, red-breasted merganser, and the various kinds of geese, ducks, and swan. Forest birds include the white-crowned, common, and yellow-billed sparrow, red-winged

blackbird, yellow warbler, song sparrow, America robin, and the barn swallow. Ground-dwelling birds include the spruce grouse, white-tailed ptarmigan, ring-neck pheasant, and gray partridge (BCMoE 2018).

Based on the site information, the areas surrounding the site provide a desirable habitat for some ecological receptor groups, such as small mammals and birds, as well as plants and soil invertebrates. However, the site itself is narrow, generally devoid of vegetation, and comprised of compacted and non-native soils as it was used for a rail way. Additionally, large mammals have a large enough home range that potential exposure to this Site would be limited. Aquatic ecological receptors are not being carried forward into the risk assessment, as there is no waterbody near the northern stretch of the RoW, continued sampling of the soil has shown little potential for COPC migration, and groundwater in the vicinity has not been impacted based on current groundwater samples.

6.2.2 Species of Concern

Risk assessment guidance recommends that species listed as rare, endangered, or threatened with habitats confirmed to be present within the study area or likely to be present in the future, be included as receptors in a risk assessment (EC 2012a).

Based on the Species at Risk Act (SARA), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species at Risk in British Columbia, there are a few threatened or species of special concern present in the region. In particular, there are many bird species that may be present in the area that are listed in SARA and COSEWIC (BCMoE 2018).

Terrestrial species listed as threatened or have special concern with a range that included the Site include the wolverine, grizzly bear, little brown myotis, fringed myotis, northern rubber boa, western skink, and western toad. Listed bird species include the barn swallow, yellow breasted chat, common nighthawk, western screech owl, olive sided flycatcher, banded tail pigeon, white-headed woodpecker, Williamson's sapsucker, and barn owl.

While this list of species at risk is varied, the impacted areas of the Site itself are not a desirable habitat and do not support vegetation, although vegetation is present on either side of the RoW. Given available and more desirable habitat nearby, limited size and location of the site (surrounded by residential and commercial developments in part) and the projected reuse including expanding the raised elevation and maintaining its use as a trail without vegetation, there is limited, if any, potential of exposure to listed species of concern to the site. Therefore, the identified species of concern in the region of the site do not need to be considered further.

6.3 Exposure Pathway Identification for Ecological Risk

An exposure pathway is a mechanism by which an ecological receptor is exposed to chemicals from a source. Several possible exposure pathways may exist at a site. The following four elements constitute a complete exposure pathway:

- A source and mechanism of chemical release;
- A retention or transport medium;
- A point of potential receptor contact with the affected medium; and
- A means of entry into the plant or animal at the contact point.

Complete pathways represent situations where there is potential for receptors to be exposed to contaminants. Incomplete pathways represent situations where exposure or contact with the contaminant is unlikely to occur, there risk to the receptor is negligible.

6.3.1 Soil

The CCME guidelines contain site-specific factors for soil. The site-specific factors for residential/parkland or industrial land use are as follows: direct contact (ingestion and dermal contact), vapour inhalation (slab-on-grade and basement), protection of potable groundwater, protection of groundwater for aquatic life, ecological soil and food ingestion, nutrient cycling, ecological soil contact, and management limits.

Of the pathways presented in the CCME soil guidelines, the ecological exposure pathways at the site are identified as complete or incomplete below.

6.3.1.1 Ecological Health – Soil Contact

The Site is not currently used but was used as a railway in the past. It is covered with gravel/compact soil consistent with that use. Vegetation (grasses, shrubs and trees) are located to either side of the RoW. The RoW may be snow covered during winter months. The ecological direct soil contact pathway is relevant for vegetation and soil invertebrates. Therefore, the ecological soil contact pathway is considered to be complete and was evaluated in this assessment.

6.3.1.2 Ecological Health – Freshwater Aquatic Life

The freshwater aquatic life pathway is applicable if a surface water body is located within 500 m downgradient of a site. In cases where the groundwater gradient is indeterminate, all surface water bodies within 500 m of the site are considered. This pathway is discussed as regards current soil and groundwater samples.

6.3.1.3 Ecological Health – Ingestion of Plants, Soil Invertebrates, and Prey

Plants and soil invertebrates can take up COPCs from soil into their tissues, which are then subsequently consumed by wildlife. Small mammals that are exposed to soil and food can also accumulate COPCs into their body. Therefore, food chain transfer was evaluated for birds and mammals.

6.3.2 Surface Water/Groundwater

Federal water quality guidelines for use at contaminated sites are applicable based on the proximity to surface waterbodies and drinking water, livestock watering or crop irrigation use. For groundwater within 10 m of a surface waterbody and for water samples collected directly from a waterbody, the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life for the protection of aquatic life apply.

For groundwater greater than 10 m from a surface waterbody, the FIGQG apply. The FIGQG include site specific factors for groundwater including: inhalation, soil organism direct contact, freshwater life, marine life, irrigation, livestock, and wildlife watering. The pathways for marine life, irrigation, livestock were not considered further as they do not apply to the Site or its future use. For the contaminants of concern for this Site, the FIGQG and the Canadian Water Quality Guidelines are equivalent.

6.3.2.1 Ecological Health – Freshwater Aquatic Life

The freshwater aquatic life pathway is applicable if a surface water body is located within 500 m downgradient of a site. In cases where the groundwater gradient is indeterminate, all surface water bodies within 500 m of the site are considered. However, this pathway was evaluated by assessing the potential for COPCs to migrate or leach from soil, as well as collection of groundwater samples to determine the presence of COPCs in groundwater. Soil data has shown little evidence of COPC migration and little potential for leaching. Groundwater samples were collected, and only very low concentrations of copper and one PAH were detected; all detections were below drinking water

quality guidelines. Therefore, while chemicals in soil were identified that exceeded the soil screening levels (Table 6-1, below), no further evaluation was conducted because sampling has shown no leaching or migration, and no impacts to groundwater

6.3.2.2 Results of the Problem Formulation

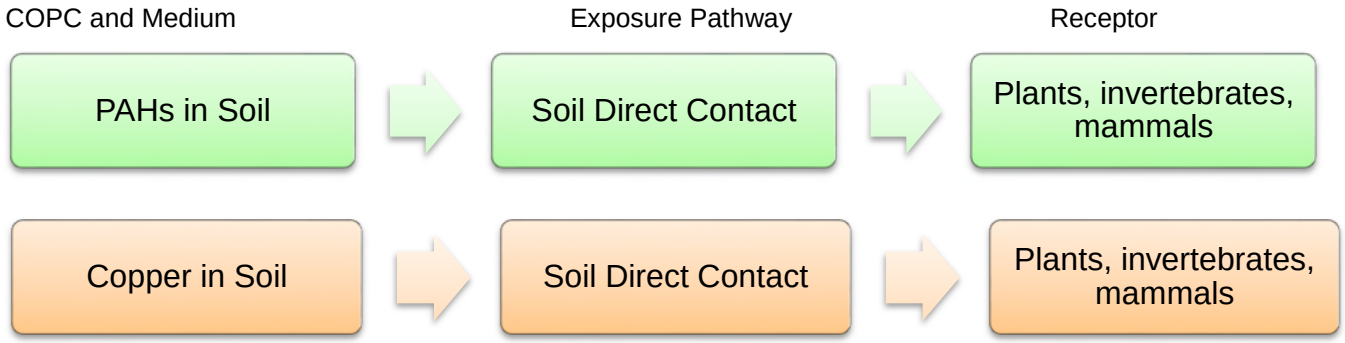
Below is a summary of the COPCs carried forward into the ecological risk assessment after the problem formulation. Bolded pathways have been carried forward.

Table 6- 1: Summary of COPCs

Remaining COPCs	Pathway	
	Terrestrial Ecological	**Aquatic Ecological**
Metals		
Copper	**Soil Organism Direct Contact Pathway is Complete**	Although soil concentrations exceed soil contact screening levels, Freshwater Life Pathway is not Complete and there is no indication that metals are leaching from soil
Polycyclic Aromatic Hydrocarbons		
Benzo(a)pyrene	**Soil Organism Direct Contact Pathway is Complete**	Although soil concentrations exceed soil contact screening levels, Freshwater Life Pathway is not Complete and there is no indication that metals are leaching from soil
Benzo(b)fluoranthene	**Soil Organism Direct Contact Pathway is Complete**	Although soil concentrations exceed soil contact screening levels, Freshwater Life Pathway is not Complete and there is no indication that metals are leaching from soil --
Benzo(g,h,i)perylene	**Soil Organism Direct Contact Pathway is Complete**	Although soil concentrations exceed soil contact screening levels, Freshwater Life Pathway is not Complete and there is no indication that metals are leaching from soil
Benzo(k)fluoranthene	**Soil Organism Direct Contact Pathway is Complete**	Although soil concentrations exceed soil contact screening levels, Freshwater Life Pathway is not Complete and there is no indication that metals are leaching from soil
Indeno(1,2,3-c,d)pyrene	**Soil Organism Direct Contact Pathway is Complete**	Although soil concentrations exceed soil contact screening levels, Freshwater Life Pathway is not Complete and there is no indication that metals are leaching from soil

6.4 Conceptual Exposure Model

A summary of the contaminant transport mechanisms, potentially impacted media, receptors of concern, COPCs, and potentially complete exposure pathways is presented in a Conceptual Exposure Model below. The exposure models would apply to the three land use scenarios outlined in the Section 5.0, but the most stringent criteria have been used herein to evaluate potential hazards.



6.5 Exposure Assessment

Similar to the human health risk assessment, the exposure point concentration represents the concentration to which the identified receptors could be exposed under the pathways determined in the problem formulation. COPCs were selected from the most recent two data sets, and for soil, all samples collected from a depth of 0 mbg to 0.7 mbg. ProUCL v 5.02 (USEPA 2016) were used to summarize the data for each COPC, determine its distribution, and calculate an upper bound concentration (the 95 percent upper confidence limit of the mean, 95UCL) to be used as the exposure point concentration. ProUCL recommends a minimum of 10 discrete sampling results to adequately estimate an exposure point concentration. The sampling results from both the Phase II and Phase III ESA sampling investigations were combined for the selected COPCs to determine an exposure point concentration for each to be used for risk assessment purposes. In instances where duplicate samples were available, the higher of the original or duplicate sample was used as representative of site conditions, and was included in the calculation of the exposure point concentration. Individual sample results were entered into ProUCL v. 5.02 (USEPA 2016) and the following summary statistics were produced: mean of detected concentration, data distribution, and 95UCL concentration. The ProUCL output data is located in Appendix D.

Table 6-2: Exposure Point Concentrations for Soil COPCs

Chemical	Minimum (mg/kg)	Maximum (mg/kg)	Frequency of Detection	UCL (1) (mg/kg)	Distribution
Metals					
Copper	6.9	239	193/193	63.2	Not Discernable
PAHs					
Benzo(a) pyrene	0.01	1.3	73/182	0.118	Lognormal
Benzo(b)fluoranthene	0.01	2.52	85/182	0.284	Gamma
Benzo(g,h,i) Perylene	0.021	16.2	76/182	0.881	Lognormal
Benzo(k)fluoranthene	0.011	1.14	69/182	0.122	Gamma
Indeno(1,2,3-c,d)pyrene	0.021	3.54	70/182	0.345	Gamma

(1) Distribution generated by ProUCL and used by the program to estimate a UCL for use as an exposure point concentration.

6.6 Hazard Assessment

The objective of the hazard (toxicity) assessment is to determine if chronic exposure of ecological receptors carries a risk of adverse health effects at the population level. For ecological receptors, the goal is not to protect each individual from any potentially toxic effect, but rather to protect enough individuals so that a viable population and community of organisms can be maintained (SAB 2006). To evaluate this, the calculated 95UCL exposure concentration was compared to the lowest available screening concentration for ecological receptors from CCME

and CSR. COPCs for the ecological assessment included chromium, copper, nickel, zinc; and the PAHs benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene and indeno (1,2,3-c,d) pyrene. As shown in Table 6-3, there are no exceedances of the guideline levels based on the 95UCL concentrations of any of these COPCs. Use of the 95UCL concentration is recommended in the Tier 1 Ecological Risk Assessment Policy Decision Summary (BC MOE 2018).

Table 6-3. Comparison of Exposure Point Concentration to Ecological Screening Levels

Chemical	UCL [1] (mg/kg)	Screening Level [2] (mg/kg)	Exceedance?	Ratio
Metals				
Copper	63.2	64	No	0.99
Benzo(a) pyrene	0.118	1	No	0.12
Benzo(b)fluoranthene	0.284	1	No	0.28
Benzo(g,h,i) Perylene	0.881	1	No	0.88
Benzo(k)fluoranthene	0.122	1	No	0.12
Indeno(1,2,3-c,d)pyrene	0.345	1	No	0.35

[1] As calculated by ProUCL using all samples from the Phase II and Phase III ESA soil sampling.
[2] Screening level is lowest value of CCME and CSR Residential/Parkland and Commercial Land Guideline levels.

6.7 Ecological Risk Characterization

Risk was evaluated for ecological receptors quantified by comparing the 95UCL concentrations to the ecological screening values in Table 6-3. The methodology used to calculate HQ values and the results are presented below.

6.7.1 Hazard Quotient Assessment

The potential for wildlife hazards can be estimated numerically using a HQ. A HQ is the ratio of the potential exposure to a single chemical to an estimated using the ecological screening level.

HQs were calculated for each COC-receptor combination as follows:

$$\text{Hazard Quotient} = \frac{\text{Soil concentration (mg/kg)}}{\text{Screening Level (mg/kg)}}$$

If the HQ is less than or equal to 1.0, the COPC is considered to pose a negligible hazard to the receptor. Hazard quotients in excess of 1.0 should be reviewed and consideration given towards the assumptions used to estimate exposure, and the uncertainty used to derive the screening level. The soil concentration used for the HQ calculation was the 95UCL as determined by ProUCL, using data from the Phase II and Phase III ESA sampling and the lowest ecological screening level from CCME and CSR were sued for this analysis.

No ratios were above 1.0. The ratio for copper was close to 1.0 but the likelihood of chronic exposure for plants and invertebrates to the RoW trail is low, given the intentionally compacted soil and desire to keep it free from vegetation. In addition, Individual samples for copper that exceeded the guideline of 63 mg/kg were:

16TP02

16TP28

16TP34

16TP36

16TP34-E1

16TP39-W1

All of these samples were within the former rail bed and none were beyond the embankments.

Note that the CSR guideline for residential/parkland is 150 mg/kg and it is 250 mg/kg for commercial land use; the 95UCL concentration for copper is well below these levels. The CCME commercial land us guideline is 91 mg/kg also higher than the calculated 95UCL exposure concentration.

6.8 Risk Characterization

Given the lack of exceedance of stringent guidelines based on the exposure concentrations, it is unlikely that the RoW poses a risk to ecological receptors.

As show in Table 4-1 and 4-2, the maximum concentration of copper exceeded the lowest screening levels available for this metal. The screening levels were based on effects to ecological receptors. After aggregating the available soil data and calculating a 95UCL exposure concentration, the exposure concentration was compared to the screening levels and copper did not pose a risk to ecological receptors at the population level (Table 6-3). As the exposure concentrations were below the lowest screening levels, no risks are expected for any ecological receptors including sensitive, protected or endangered species.

Similarly, the 95UCL concentrations for PAHs that were retained as COPCs were also below the lowest ecological screening concentrations. Again, there were no exceedances, indicating that there is little potential for impacts to ecological receptors from this Site.

While comparison of maximum detected concentrations to CCME and CSR guidelines for ecological receptors identified individual locations of exceedances for the COPCs, the relatively small areas of impact, difficult growing conditions and low habitat quality due to coarse and compacted soil make it unlikely that the any COPC will have a population-level effect on plants or invertebrates. In addition, the overall exposure point concentrations did not indicate a potential for hazard. The lack of plants providing a food source to mammals and birds would also decrease the potential for foraging by terrestrial mammals. Further, reuse plans should include retaining the compacted soil RoW for use as a trail, limiting plant growth or soil invertebrates in the contaminated media.

7.0 CONCLUSIONS

In conclusion, the Site has been evaluated for human health risks and found to have little potential to adversely impact humans under residential, industrial, or recreational visitor scenarios. In addition, the Site has been evaluated for ecological risks and found to present little potential for adverse impacts to terrestrial or aquatic receptors. These conclusions are based on current site conditions as determined through soil and groundwater sampling, and are appropriate to potential future site use as a recreational trail, residential land use or industrial land use.

8.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
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APPENDIX A

PHASE II ESA AND PHASE III ESA DATA

Table 2: Soil Quality Assurance/Quality Control Analytical Results

Parameter	Unit	RDL	16TP06	DUP01	RPD (%)	16TP11	DUP02	RPD (%)	16TP16	DUP03	RPD (%)	16TP22	DUP04	RPD (%)	16TP27	DUP05	RPD (%)
			0.7 m			0.7 m			0 m			0.7 m			0 m		
			11-Aug-2016			11-Aug-2016			12-Aug-2016			12-Aug-2016			12-Aug-2016		
Physical Parameters																	
pH	pH Units	0.1	7.5	7.6	1	7.4	7.4	0	8.1	7.8	4	7.3	8.1	10	8.5	8.8	3
Moisture	%	0.1	7.6	7.9	4	10.3	10.3	0	0.7	2.4	**110**	1.2	1.2	0	1.7	1.7	0
Metals																	
Antimony	µg/g	0.1	<0.1	<0.1	-	<0.1	<0.1	-	1.3	0.4	-	<0.1	<0.1	-	0.2	0.2	-
Arsenic	µg/g	0.4	1.3	1.4	-	1.3	1.2	-	4.1	3.2	25	0.7	0.7	-	2.3	2.1	9
Barium	µg/g	1	76	67	13	73	64	13	90	68	28	45	44	2	58	62	7
Beryllium	µg/g	0.1	0.4	0.4	-	0.4	0.4	-	0.2	0.2	-	0.3	0.2	-	0.2	0.2	-
Boron	µg/g	2	<2	<2	-	<2	<2	-	<2	<2	-	<2	<2	-	<2	<2	-
Cadmium	µg/g	0.04	0.08	0.08	-	0.10	0.09	-	0.47	0.36	27	0.05	0.05	-	0.18	0.17	-
Chromium	µg/g	1	23.8	24.7	4	24.1	22.4	7	34.0	28.8	17	15.1	15.2	1	22.9	20.0	14
Cobalt	µg/g	0.1	11.2	11.3	1	11.3	10.9	4	9.4	8.0	16	7.1	7.4	4	6.1	6.1	0
Copper	µg/g	0.2	12.2	13.2	8	11.7	12.4	6	113	60.8	**60**	6.6	7.2	9	25.7	29.2	13
Lead	µg/g	0.2	2.8	3.1	10	3.0	3.0	0	20.6	11.1	60	0.5	0.6	-	3.6	3.6	0
Lithium	µg/g	0.1	6.9	7.4	7	7.1	6.6	7	8.4	7.4	13	4.3	3.2	29	7.1	5.5	25
Manganese	µg/g	0.4	518	509	2	540	518	4	386	350	10	301	309	3	253	272	7
Mercury	µg/g	0.04	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-
Molybdenum	µg/g	0.1	0.7	0.7	0	0.8	0.8	0	1.9	1.6	17	0.9	1.0	11	0.7	0.8	13
Nickel	µg/g	0.4	18.7	18.9	1	18.7	17.7	5	29.6	28.7	3	11.5	14.6	24	18.8	18.4	2
Selenium	µg/g	0.5	<0.5	<0.5	-	<0.5	<0.5	-	0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-
Silver	µg/g	0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-
Strontium	µg/g	0.2	39.9	36.0	10	42.8	36.7	15	52.5	51.7	2	28.6	28.8	1	32.3	31.1	4
Thallium	µg/g	0.1	<0.1	<0.1	-	<0.1	<0.1	-	0.2	0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
Tin	µg/g	0.2	0.5	0.6	-	0.5	0.5	-	2.1	1.3	47	0.4	0.4	-	0.3	0.4	-
Uranium	µg/g	0.1	0.7	0.8	13	0.7	0.7	0	0.7	0.8	13	0.5	0.5	0	0.5	0.5	0
Vanadium	µg/g	0.4	48.0	53.3	10	46.9	46.4	1	48.5	42.4	13	33.1	33.2	0.3	29.9	30.6	2
Zinc	µg/g	2	59	60	2	58	62	7	71	80	12	37	63	52	38	39	3
Hydrocarbons																	
F2 (C_{10}-C_{16})	µg/g	100	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-
F2 (C_{10}-C_{16})-Naphthalene	µg/g	100	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-
F3 (C_{16}-C_{34})	µg/g	200	<200	<200	-	<200	<200	-	268	<200	-	<200	<200	-	<200	<200	-
F3 (C_{16}-C_{34})-PAH	µg/g	200	<200	<200	-	<200	<200	-	259	<200	-	<200	<200	-	<200	<200	-
F4 (C_{34}-C_{50})	µg/g	200	<200	<200	-	<200	<200	-	<200	<200	-	<200	<200	-	<200	<200	-
Polycyclic Aromatic Hydrocarbons (PAHs)																	
2-methylnaphthalene	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	0.026	0.026	-	<0.010	<0.010	-	<0.010	<0.010	-
Acenaphthene	µg/g	0.005	<0.005	<0.005	-	<0.005	<0.006	-	0.039	0.025	44	<0.005	<0.005	-	<0.005	<0.005	-
Acenaphthylene	µg/g	0.005	<0.006	<0.005	-	<0.006	<0.005	-	0.348	0.431	21	<0.007	<0.007	-	<0.006	<0.008	-
Anthracene	µg/g	0.004	<0.004	<0.004	-	<0.004	<0.004	-	0.739	0.867	16	<0.004	<0.004	-	<0.004	<0.004	-
Benz(a)anthracene	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	0.585	0.634	8	<0.010	<0.010	-	<0.010	<0.010	-
Benzo(a)pyrene	ug/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	1.17	1.30	11	<0.010	<0.010	-	<0.010	<0.010	-
Benzo(b)fluoranthene	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	2.08	2.52	19	<0.010	<0.010	-	<0.010	<0.010	-
Benzo(g,h,i)perylene	µg/g	0.02	<0.020	<0.020	-	<0.020	<0.020	-	2.96	3.54	18	<0.020	<0.020	-	<0.020	<0.020	-
Benzo(k)fluoranthene	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	1.02	1.14	11	<0.010	<0.010	-	<0.010	<0.010	-
Chrysene	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	1.50	1.72	14	<0.010	<0.010	-	<0.010	<0.010	-
Dibenz(a,h)anthracene	µg/g	0.005	<0.005	<0.005	-	<0.005	<0.005	-	0.224	0.279	22	<0.005	<0.005	-	<0.005	<0.005	-
Fluoranthene	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	1.05	0.777	30	<0.010	<0.010	-	<0.010	<0.010	-
Fluorene	µg/g	0.01	<0.0100	<0.0100	-	<0.0100	<0.0100	-	0.058	0.040	37	<0.010	<0.010	-	<0.010	<0.010	-
Indeno(1,2,3-c,d)pyrene	µg/g	0.02	<0.020	<0.020	-	<0.020	<0.020	-	1.74	2.04	16	<0.020	<0.020	-	<0.020	<0.020	-
Naphthalene	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	0.030	0.030	-	<0.010	<0.010	-	<0.010	<0.010	-
Phenanthrene	µg/g	0.02	<0.020	<0.020	-	<0.020	<0.020	-	0.281	0.149	61	<0.020	<0.020	-	<0.020	<0.020	-
Pyrene	µg/g	0.02	<0.020	<0.020	-	<0.020	<0.020	-	1.12	0.923	19	<0.020	<0.020	-	<0.020	<0.020	-
BaP TPE	µg/g	0.01	<0.010	<0.010	-	<0.010	<0.010	-	1.98	2.27	14	<0.010	<0.010	-	<0.010	<0.010	-
IACR	µg/g	0.062	<0.062	<0.062	-	<0.062	<0.062	-	27.1	31.6	15	<0.062	<0.062	-	<0.062	<0.062	-
Laboratory Identification Number			6080946-12	6080946-27		6080946-22	6080946-28		6081035-05	6081035-31		6081035-18	6081035-32		6081035-27	6081035-33	

NOTES:

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			0.7 m			0.7 m			0 m			0.7 m			0 m		
			11-Aug-2016			11-Aug-2016			12-Aug-2016			12-Aug-2016			12-Aug-2016		
Volatile Organic Compounds (VOCs)																	
VH_{6-10}	µg/g	20	<20	<20	-	<20	<20	-	<20	<20	-	<20	<20	-	<20	<20	-
VPHs	µg/g	20	<20	<20	-	<20	<20	-	<20	<20	-	<20	<20	-	<20	<20	-
Benzene	µg/g	0.02	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-
Bromodichloromethane	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
Bromoform	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
Carbon tetrachloride	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Chlorobenzene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Chloroform	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Dibromochloromethane	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
1,2-Dibromoethane	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
Dibromomethane	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
1,2-Dichlorobenzene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,3-Dichlorobenzene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,4-Dichlorobenzene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1-Dichloroethane	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,2-Dichloroethane	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1-Dichloroethene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
cis-1,2-dichloroethene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
trans-1,2-dichloroethene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,2-Dichloropropane	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,3-Dichloropropene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Ethylbenzene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Methylene Chloride	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
MTBE	µg/g	0.04	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-
Styrene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1,2,2-Tetrachloroethane	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Tetrachloroethene	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Toluene	µg/g	0.2	<0.20	<0.20	-	<0.20	<0.20	-	<0.20	<0.20	-	<0.20	<0.20	-	<0.20	<0.20	-
1,1,1-Trichloroethane	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1,2-Trichloroethane	µg/g	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Trichloroethene	µg/g	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Trichlorofluoromethane	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
Vinyl chloride	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
Xylenes Total	µg/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-
Laboratory Identification Number			6080946-12	6080946-27		6080946-22	6080946-28		6081035-05	6081035-31		6081035-18	6081035-32		6081035-27	6081035-33	

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			11-Aug-2016			11-Aug-2016			12-Aug-2016			12-Aug-2016			12-Aug-2016		
Herbicides, Pesticides and Fungicides																	
Alachlor	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aldrin	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
a-BHC	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
a-Chlordane	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Atrazine	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Azinophos methyl	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
b-BHC	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromacil	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoxynil	µg/g	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Captan	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorothalonil	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorpyrifos	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanazine	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
d-BHC	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Deltamethrin	µg/g	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diazinon	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorvos	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diclofop-methyl	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dieldrin	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethoate	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Disulfoton	µg/g	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diuron	µg/g	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan I	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan II	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan sulphate	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin aldehyde	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endrin ketone	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
g-BHC (Lindane)	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
g-Chlordane	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor epoxide	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Linuron	µg/g	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malathion	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methoxychlor	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl parathion	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metolachlor	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metribuzin	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
p,p-DDD	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
p,p-DDE	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
p,p-DDT	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parathion	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachloronitrobenzene	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phorate	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prometon	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ronnel (Fenchlorphos)	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Simazine	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfotepp	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tebuthiuron	µg/g	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Temephos (Abate)	µg/g	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Terbufos	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triallate	µg/g	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trifluralin	µg/g	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laboratory Identification Number			6080946-12	6080946-27		6080946-22	6080946-28		6081035-05	6081035-31		6081035-18	6081035-32		6081035-27	6081035-33	

NOTES:

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< Concentration is less than the laboratory detection limit indicated.
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High variability metals include: Ag, Al, Ba, Hg, K, Mo, Na, Pb, Sn, Sr, and Ti

Table 2: Soil Quality Assurance/Quality Control Analytical Results

Parameter	Unit	RDL	16TP30	DUP06	RPD (%)	16BGR01	DUP07	RPD (%)	16TP35-0.7m	DUP08	RPD (%)	16TP39-0.7m	DUP09	RPD (%)
			0.7 m			0 m			0.7 m			0.7 m		
			15-Aug-2016			15-Aug-2016			15-Aug-2016			15-Aug-2016		
Physical Parameters														
pH	pH Units	0.1	7.7	8.0	4	6.9	6.9	0	8.4	8.2	2	7.8	7.9	1
Moisture	%	0.1	7.5	5.5	31	2.2	2.7	20	2.9	3	3	5.3	4.3	21
Metals														
Antimony	µg/g	0.1	<0.1	<0.1	-	<0.1	0.1	-	0.1	0.1	-	0.2	0.2	-
Arsenic	µg/g	0.4	1.0	0.9	-	1.5	1.9	-	2.1	1.7	-	3.0	2.9	3
Barium	µg/g	1	85	89	5	91	99	8	56	59	5	77	120	44
Beryllium	µg/g	0.1	0.4	0.3	-	0.4	0.5	-	0.3	0.2	-	0.4	0.4	-
Boron	µg/g	2	<2	<2	-	<2	<2	-	<2	<2	-	<2	<2	-
Cadmium	µg/g	0.04	0.09	0.09	-	0.14	0.18	-	0.20	0.18	-	0.18	0.21	-
Chromium	µg/g	1	22.6	22.0	3	17.3	16.4	5	15.2	21.8	36	23.4	25.3	8
Cobalt	µg/g	0.1	10.6	9.3	13	6.3	6.3	0	5.1	5.3	4	6.9	7.5	8
Copper	µg/g	0.2	13.1	10.5	22	12.7	14.1	10	14.0	14.2	1	25.1	23.8	5
Lead	µg/g	0.2	2.2	2.0	10	4.5	5.5	20	2.5	2.7	8	5.2	5.4	4
Lithium	µg/g	0.1	7.1	7.0	1	8.5	9.6	12	9.4	9.7	3	11.8	11.9	1
Manganese	µg/g	0.4	480	436	10	386	392	2	323	303	6	324	346	7
Mercury	µg/g	0.04	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-
Molybdenum	µg/g	0.1	0.9	1.2	29	1.6	0.4	-	0.4	0.3	-	0.7	0.6	15
Nickel	µg/g	0.4	18.1	17.2	5	12.1	13.2	9	13.2	14.4	9	18.8	19.6	4
Selenium	µg/g	0.5	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-
Silver	µg/g	0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-
Strontium	µg/g	0.2	48.7	46.2	5	19.5	27.9	35	29.3	23.5	22	24.1	31.6	27
Thallium	µg/g	0.1	<0.1	<0.1	-	<0.1	0.1	-	<0.1	<0.1	-	0.1	0.1	-
Tin	µg/g	0.2	0.5	0.5	-	0.3	0.4	-	0.3	0.3	-	0.5	0.5	-
Uranium	µg/g	0.1	0.7	2.0	**96**	0.7	0.9	25	0.4	1.0	-	2.0	0.9	**76**
Vanadium	µg/g	0.4	45.4	39.8	13	27.9	28.1	1	30.4	33.9	11	39.2	39.2	0
Zinc	µg/g	2	52	45	14	46	44	4	35	37	6	45	44	2
Hydrocarbons														
F2 (C_{10}-C_{16})	µg/g	100	<100	<100	-	-	-	-	<100	<100	-	<100	<100	-
F2 (C_{10}-C_{16})-Naphthalene	µg/g	100	<100	<100	-	-	-	-	<100	<100	-	<100	<100	-
F3 (C_{16}-C_{34})	µg/g	200	<200	<200	-	-	-	-	<200	<200	-	<200	<200	-
F3 (C_{16}-C_{34})-PAH	µg/g	200	<200	<200	-	-	-	-	<200	<200	-	<200	<200	-
F4 (C_{34}-C_{50})	µg/g	200	<200	<200	-	-	-	-	<200	<200	-	<200	<200	-
Polycyclic Aromatic Hydrocarbons (PAHs)														
2-methylnaphthalene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	<0.010	-
Acenaphthene	µg/g	0.005	<0.005	<0.005	-	-	-	-	<0.006	<0.005	-	<0.005	0.006	-
Acenaphthylene	µg/g	0.005	<0.008	<0.005	-	-	-	-	<0.005	<0.005	-	<0.006	0.033	-
Anthracene	µg/g	0.004	<0.004	<0.004	-	-	-	-	<0.004	<0.004	-	0.007	0.093	-
Benz(a)anthracene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	0.030	-
Benzo(a)pyrene	ug/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	0.078	-
Benzo(b)fluoranthene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	0.119	-
Benzo(g,h,i)perylene	µg/g	0.02	<0.020	<0.020	-	-	-	-	<0.020	<0.020	-	0.126	1.63	**171**
Benzo(k)fluoranthene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	0.046	-
Chrysene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	0.057	-
Dibenz(a,h)anthracene	µg/g	0.005	<0.005	<0.005	-	-	-	-	<0.005	<0.005	-	<0.005	0.020	-
Fluoranthene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	0.041	-
Fluorene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	<0.010	-
Indeno(1,2,3-c,d)pyrene	µg/g	0.02	<0.020	<0.020	-	-	-	-	<0.020	<0.020	-	<0.020	0.257	-
Naphthalene	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	<0.010	-
Phenanthrene	µg/g	0.02	<0.020	<0.020	-	-	-	-	<0.020	<0.020	-	<0.020	<0.020	-
Pyrene	µg/g	0.02	<0.020	<0.020	-	-	-	-	<0.020	<0.020	-	<0.020	0.059	-
BaP TPE	µg/g	0.01	<0.010	<0.010	-	-	-	-	<0.010	<0.010	-	<0.010	0.161	-
IACR	µg/g	0.062	<0.062	<0.062	-	-	-	-	<0.062	<0.062	-	<0.062	1.78	-
Laboratory Identification Number			6081116-10	6081116-29		6081116-03	6081116-30		6081116-20	6081116-31		6081116-28	6081116-32	

NOTES:

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			0.7 m			0 m			0.7 m			0.7 m		
			15-Aug-2016			15-Aug-2016			15-Aug-2016			15-Aug-2016		
Volatile Organic Compounds (VOCs)														
VH_{6-10}	µg/g	20	<20	<20	-	-	-	-	<20	<20	-	<20	<20	-
VPHs	µg/g	20	<20	<20	-	-	-	-	<20	<20	-	<20	<20	-
Benzene	µg/g	0.02	<0.02	<0.02	-	-	-	-	<0.02	<0.02	-	<0.02	<0.02	-
Bromodichloromethane	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
Bromoform	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
Carbon tetrachloride	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Chlorobenzene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Chloroform	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Dibromochloromethane	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
1,2-Dibromoethane	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
Dibromomethane	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
1,2-Dichlorobenzene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,3-Dichlorobenzene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,4-Dichlorobenzene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1-Dichloroethane	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,2-Dichloroethane	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1-Dichloroethene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
cis-1,2-dichloroethene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
trans-1,2-dichloroethene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,2-Dichloropropane	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,3-Dichloropropene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Ethylbenzene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Methylene Chloride	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
MTBE	µg/g	0.04	<0.04	<0.04	-	-	-	-	<0.04	<0.04	-	<0.04	<0.04	-
Styrene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1,2,2-Tetrachloroethane	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Tetrachloroethene	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Toluene	µg/g	0.2	<0.20	<0.20	-	-	-	-	<0.20	<0.20	-	<0.20	<0.20	-
1,1,1-Trichloroethane	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
1,1,2-Trichloroethane	µg/g	0.05	<0.05	<0.05	-	-	-	-	<0.05	<0.05	-	<0.05	<0.05	-
Trichloroethene	µg/g	0.01	<0.01	<0.01	-	-	-	-	<0.01	<0.01	-	<0.01	<0.01	-
Trichlorofluoromethane	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
Vinyl chloride	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
Xylenes Total	µg/g	0.1	<0.10	<0.10	-	-	-	-	<0.10	<0.10	-	<0.10	<0.10	-
Laboratory Identification Number			6081116-10	6081116-29		6081116-03	6081116-30		6081116-20	6081116-31		6081116-28	6081116-32	

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			0.7 m			0 m			0.7 m			0.7 m		
			15-Aug-2016			15-Aug-2016			15-Aug-2016			15-Aug-2016		
Herbicides, Pesticides and Fungicides														
Alachlor	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Aldrin	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
a-BHC	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
a-Chlordane	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Atrazine	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Azinophos methyl	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
b-BHC	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Bromacil	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Bromoxynil	µg/g	0.02	-	-	-	<0.020	<0.020	-	-	-	-	-	-	-
Captan	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Chlorothalonil	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Chlorpyrifos	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Cyanazine	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
d-BHC	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Deltamethrin	µg/g	0.05	-	-	-	<0.050	<0.050	-	-	-	-	-	-	-
Diazinon	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Dichlorvos	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Diclofop-methyl	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Dieldrin	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Dimethoate	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Disulfoton	µg/g	0.02	-	-	-	<0.020	<0.020	-	-	-	-	-	-	-
Diuron	µg/g	0.02	-	-	-	<0.020	<0.020	-	-	-	-	-	-	-
Endosulfan I	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Endosulfan II	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Endosulfan sulphate	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Endrin	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Endrin aldehyde	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Endrin ketone	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
g-BHC (Lindane)	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
g-Chlordane	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Heptachlor	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Heptachlor epoxide	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Linuron	µg/g	0.02	-	-	-	<0.020	<0.020	-	-	-	-	-	-	-
Malathion	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Methoxychlor	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Methyl parathion	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Metolachlor	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Metribuzin	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
p,p-DDD	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
p,p-DDE	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
p,p-DDT	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Parathion	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Pentachloronitrobenzene	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Phorate	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Prometon	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Ronnel (Fenchlorphos)	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Simazine	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Sulfotepp	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Tebuthiuron	µg/g	0.02	-	-	-	<0.020	<0.020	-	-	-	-	-	-	-
Temephos (Abate)	µg/g	0.05	-	-	-	<0.050	<0.050	-	-	-	-	-	-	-
Terbufos	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Triallate	µg/g	0.005	-	-	-	<0.005	<0.005	-	-	-	-	-	-	-
Trifluralin	µg/g	0.01	-	-	-	<0.010	<0.010	-	-	-	-	-	-	-
Laboratory Identification Number			6081116-10	6081116-29		6081116-03	6081116-30		6081116-20	6081116-31		6081116-28	6081116-32	

NOTES:

- Not analyzed or RPD not calculated.
< Concentration is less than the laboratory detection limit indicated.
RDL Laboratory Reportable Detection Limit
RPD RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
RPDs have only been considered where a concentration is greater than 5 times the RDL
BOLD High RPDs are in bold (acceptable RPD is 45% for metals in soil [60% for high variability metals] 75% for PAHs in soil, and 60% for EPH and other organics in soil as recommended by BC Ministry of Environment Q&A, and BC Environmental Laboratory Manual).
High variability metals include: Ag, Al, Ba, Hg, K, Mo, Na, Pb, Sn, Sr, and Ti

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP02E1 SA#1	16TP02E1 SA#2	16TP02E2 SA#1	16TP02E2 SA#2	16TP02W1 SA#1		16TP02W1 SA#2
							0.15 m	0.4	0.15 m	0.4 m	0.15 m	0.15 m	0.4 m
							5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017		5/29/2017
							16TP02E1 SA#1 D=0.15m	16TP02E1 SA#2 D=0.4m	16TP02E2 SA#1 D=0.15m	16TP02E2 SA#2 D=0.4m	16TP02W1 SA#1 D=0.15m	DUP #1	16TP02W1 SA#2 D=0.4m
Physical Parameters													
Moisture	%	-	-	-	-	-	6.6	15.2	13.7	12.7	3.1	3.8	16.2
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.006	<0.005	<0.005	<0.005	0.013	0.014	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.018	<0.004	<0.004	<0.004	0.039	0.04	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.011	<0.01	<0.01	<0.01	0.033	0.036	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.019	<0.01	<0.01	<0.01	0.052	0.079	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.075	<0.01	<0.01	<0.01	0.131	0.146	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.059	<0.02	<0.02	<0.02	0.129	0.151	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.021	<0.01	<0.01	<0.01	0.053	0.063	<0.01
Chrysene	µg/g	-	-	-	-	-	0.031	<0.01	<0.01	<0.01	0.071	0.065	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.005	<0.005	<0.005	<0.005	0.012	0.015	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.026	<0.01	<0.01	<0.01	0.064	0.049	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.027	<0.02	<0.02	<0.02	0.062	0.083	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.026	<0.02	<0.02	<0.02	0.067	0.055	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.0412	<0.01	<0.01	<0.01	0.0986	0.135	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.1236	0.03	0.03	0.03	0.2958	0.405	0.03
IACR (CCME)	µg/g	1	1	-	-	-	0.905	<0.0625	<0.0625	<0.0625	**1.86**	**2.16**	<0.0625
Laboratory Identification Number							7052353_7052353-05	7052353_7052353-06	7052353_7052353-01	7052353_7052353-02	7052353_7052353-13	7052353_7052353-41	7052353_7052353-14

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP02W2 SA#1	16TP02W2 SA#2	16TP04E1 SA#1	16TP04E1 SA#2	16TP04E2 SA#1	16TP04E2 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017
							16TP02W2 SA#1 D=0.15m	16TP02W2 SA#2 D=0.4m	16TP04E1 SA#1 D=0.15m	16TP04E1 SA#2 D=0.4m	16TP04E2 SA#1 D=0.15m	16TP04E2 SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	13	10.8	5.1	6.3	2.3	2.5
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	<0.004	<0.004	0.011	<0.004	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	<0.01	<0.01	0.011	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.014	<0.01	0.032	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	<0.02	<0.02	0.021	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	<0.01	<0.01	0.011	<0.01	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	<0.01	<0.01	0.018	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.01	<0.01	0.015	<0.01	<0.01	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	<0.01	<0.01	0.0167	<0.01	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.03	0.03	0.0501	0.03	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	0.0905	<0.0625	0.384	<0.0625	<0.0625	<0.0625
Laboratory Identification Number							7052353_7052353-09	7052353_7052353-10	7052353_7052353-21	7052353_7052353-22	7052353_7052353-17	7052353_7052353-18

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP04W1 SA#1	16TP04W1 SA#2	16TP04W2 SA#1	16TP04W2 SA#2	16TP14E1SA#1	16TP14E1SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/30/2017	5/30/2017
							16TP04W1 SA#1 D=0.15m	16TP04W1 SA#2 D=0.4m	16TP04W2 SA#1 D=0.15m	16TP04W2 SA#2 D=0.4m	16TP14E1SA#1 D=0.15m	16TP14E1SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	4.1	4.4	9.3	4	3	13.2
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	0.009	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	<0.005	<0.005	<0.005	<0.005	0.034	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.017	<0.004	<0.004	<0.004	0.101	0.005
Benz(a)anthracene	µg/g	1	10	1	1	10	0.012	<0.01	<0.01	<0.01	0.051	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.022	<0.01	<0.01	<0.01	0.124	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.056	<0.01	<0.01	<0.01	0.295	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.046	<0.02	<0.02	<0.02	0.668	0.027
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.02	<0.01	<0.01	<0.01	0.127	<0.01
Chrysene	µg/g	-	-	-	-	-	0.029	<0.01	<0.01	<0.01	0.142	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	<0.005	<0.005	<0.005	<0.005	0.04	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.024	<0.01	<0.01	<0.01	0.209	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.026	<0.02	<0.02	<0.02	0.265	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	0.046	<0.02
Pyrene	µg/g	10	100	10	10	100	0.021	<0.02	<0.02	<0.02	0.187	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.0366	<0.01	<0.01	<0.01	0.246	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.1098	0.03	0.03	0.03	0.738	0.03
IACR (CCME)	µg/g	1	1	-	-	-	0.742	<0.0625	<0.0625	<0.0625	**3.56**	<0.0625
Laboratory Identification Number							7052353_7052353-29	7052353_7052353-30	7052353_7052353-25	7052353_7052353-26	7052560_7052560-13	7052560_7052560-14

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP14E2SA#1	16TP14E2SA#2	16TP14W1SA#1		16TP14W1SA#2	16TP14W2SA#1	16TP14W2SA#2
							0.15 m	0.4 m	0.15 m		0.4 m	0.15 m	0.4 m
							5/30/2017	5/30/2017	5/30/2017		5/30/2017	5/30/2017	5/30/2017
							16TP14E2SA#1 D=0.15m	16TP14E2SA#2 D=0.4m	16TP14W1SA#1 D=0.15m	DUP #3	16TP14W1SA#2 D=0.4m	16TP14W2SA#1 D=0.15m	16TP14W2SA#2 D=0.4m
Physical Parameters													
Moisture	%	-	-	-	-	-	8.1	9	3	1.5	7.3	10.1	2.7
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	<0.005	<0.005	0.027	0.028	0.012	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	<0.004	<0.004	0.079	0.072	0.044	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	<0.01	<0.01	0.024	0.026	0.012	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	<0.01	<0.01	0.069	0.087	0.036	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	<0.01	<0.01	0.214	0.237	0.109	0.019	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	<0.02	<0.02	0.504	0.427	0.189	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	<0.01	<0.01	0.086	0.094	0.041	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	<0.01	<0.01	0.084	0.077	0.042	0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	<0.005	<0.005	0.028	0.026	0.013	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	<0.01	<0.01	0.105	0.084	0.041	<0.01	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	<0.02	<0.02	0.186	0.171	0.086	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	0.027	0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	<0.02	<0.02	0.099	0.085	0.04	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	<0.01	<0.01	0.154	0.181	0.0761	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.03	0.03	0.462	0.543	0.2283	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	<0.0625	<0.0625	**2.44**	**3.26**	**1.21**	0.121	<0.0625
Laboratory Identification Number							7052560_7052560-21	7052560_7052560-22	7052560_7052560-17	7052560_7052560-73	7052560_7052560-18	7052560_7052560-01	7052560_7052560-02

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP14N1 SA#1	16TP14N1 SA#2		16TP14S1 SA#1	16TP14S1 SA#2	16TP16E1SA#1	16TP16E1SA#2
							0.15 m	0.4 m		0.15 m	0.4 m	0.15	0.4 m
							5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/30/2017	5/30/2017
							16TP14N1 SA#1 D=0.15m	16TP14N1 SA#2 D=0.4m	DUP #2	16TP14S1 SA#1 D=0.15m	16TP14S1 SA#2 D=0.4m	16TP16E1SA#1 D=0.15m	16TP16E1SA#2 D=0.4m
Physical Parameters													
Moisture	%	-	-	-	-	-	2.8	10.1	6	3.3	5.4	2.8	8
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	398	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	396	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.056	<0.005	<0.005	0.121	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.154	<0.004	<0.004	0.273	0.009	0.019	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.071	<0.01	<0.01	0.117	<0.01	0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.278	<0.01	<0.01	0.278	<0.01	0.021	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.36	<0.01	<0.01	0.427	<0.01	0.059	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	1.9	<0.02	<0.02	1.78	<0.02	0.047	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.167	<0.01	<0.01	0.186	<0.01	0.021	<0.01
Chrysene	µg/g	-	-	-	-	-	0.116	<0.01	<0.01	0.164	<0.01	0.033	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.074	<0.005	<0.005	0.092	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.084	<0.01	<0.01	0.255	<0.01	0.027	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.539	<0.02	<0.02	0.556	<0.02	0.026	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	0.043	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.101	<0.02	<0.02	0.304	<0.02	0.026	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.501	<0.01	<0.01	0.536	<0.01	0.0354	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				1.503	0.03	0.03	1.608	0.03	0.1062	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**6.08**	<0.0625	<0.0625	**6.97**	<0.0625	0.77	<0.0625
Laboratory Identification Number							7052353_7052353-33	7052353_7052353-34	7052353_7052353-42	7052353_7052353-37	7052353_7052353-38	7052560_7052560-09	7052560_7052560-10

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP16E2SA#1	16TP16E2SA#2	16TP16N1SA#1	16TP16N1SA#2	16TP16S1SA#1	16TP16S1SA#2	16TP16W1SA#1
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m
							5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017
							16TP16E2SA#1 D=0.15m	16TP16E2SA#2 D=0.4m	16TP16N1SA#1 D=0.15m	16TP16N1SA#2 D=0.4m	16TP16S1SA#1 D=0.15m	16TP16S1SA#2 D=0.4m	16TP16W1SA#1 D=0.15m
Physical Parameters													
Moisture	%	-	-	-	-	-	3	2.6	2.8	1.9	2.5	5.7	1.6
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	629	639	249	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	629	639	245	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	0.013	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	<0.005	<0.005	<0.005	<0.005	0.148	0.009	<0.005
Anthracene	µg/g	2.5	32	-	-	-	<0.004	<0.004	0.013	<0.004	0.474	0.035	0.017
Benz(a)anthracene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	<0.01	0.129	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	<0.01	<0.01	<0.01	<0.01	0.389	0.013	0.015
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.021	<0.01	0.015	<0.01	0.726	0.022	0.044
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	<0.02	<0.02	0.027	<0.02	5.45	0.077	0.047
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	<0.01	0.298	<0.01	0.015
Chrysene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	0.245	<0.01	0.018
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	<0.005	<0.005	<0.005	<0.005	0.177	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	<0.01	<0.01	<0.01	<0.01	0.308	<0.01	0.02
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	<0.02	<0.02	<0.02	<0.02	0.919	0.021	0.026
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	**0.021**	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	**0.064**	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	<0.02	<0.02	<0.02	<0.02	0.365	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	<0.01	<0.01	<0.01	<0.01	0.83	0.0176	0.0265
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.03	0.03	0.03	0.03	2.49	0.0528	0.0795
IACR (CCME)	µg/g	1	1	-	-	-	0.132	<0.0625	0.0949	<0.0625	**9.87**	0.19	0.557
Laboratory Identification Number							7052560_7052560-05	7052560_7052560-06	7052560_7052560-33	7052560_7052560-34	7052560_7052560-37	7052560_7052560-38	7052560_7052560-29

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP16W1SA#2	16TP16W2SA#1	16TP16W2SA#2	16TP17E1SA#1	16TP17E2SA#1	16TP17W1SA#1	16TP17W2SA#1
							0.4 m	0.15 m	0.4 m	0.15 m	0.15 m	0.15 m	0.15 m
							5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017
							16TP16W1SA#2 D=0.4m	16TP16W2SA#1 D=0.15m	16TP16W2SA#2 D=0.4m	16TP17E1SA#1 D=0.15m	16TP17E2SA#1 D=0.15m	16TP17W1SA#1 D=0.15m	16TP17W2SA#1 D=0.15m
Physical Parameters													
Moisture	%	-	-	-	-	-	6.7	4.6	9.3	1.6	3.9	1.8	4.2
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	-	-	-	-
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	-	-	-	-
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	-	-	-	-
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	-	-	-	-
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	-	-	-	-
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	-	-	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.005	<0.004	<0.004	0.028	0.006	0.01	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	0.013	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	<0.01	<0.01	<0.01	0.033	0.012	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.017	<0.01	<0.01	0.091	0.028	0.033	0.011
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	<0.02	<0.02	<0.02	0.09	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	0.032	<0.01	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	0.035	0.014	0.014	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	<0.01	<0.01	<0.01	0.032	0.016	0.013	0.022
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	<0.02	<0.02	<0.02	0.044	<0.02	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	<0.02	<0.02	<0.02	0.032	<0.02	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	<0.01	<0.01	<0.01	0.0603	0.0241	0.0226	0.0204
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.03	0.03	0.03	0.181	0.072	0.068	0.061
IACR (CCME)	µg/g	1	1	-	-	-	0.109	<0.0625	<0.0625	0.9783	0.2890	0.3648	<0.0625
Laboratory Identification Number							7052560_7052560-30	7052560_7052560-25	7052560_7052560-26	7052560_7052560-53	7052560_7052560-49	7052560_7052560-45	7052560_7052560-41

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP22E1SA#1	16TP22E2SA#1	16TP22W1SA#1		16TP22W2SA#1	16TP28E1 SA#1	16TP28E1 SA#2
							0.15 m	0.15 m	0.15 m		0.15 m	0.15 m	0.4 m
							5/30/2017	5/30/2017	5/30/2017		5/30/2017	5/31/2017	5/31/2017
							16TP22E1SA#1 D=0.15m	16TP22E2SA#1 D=0.15m	16TP22W1SA#1 D=0.15m	DUP #4	16TP22W2SA#1 D=0.15m	16TP28E1 SA#1 D=0.15m	16TP28E1 SA#2 D=0.4m
Physical Parameters													
Moisture	%	-	-	-	-	-	0.8	2.6	1.4	2.2	5.9	1.8	4.1
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	-	-	-	-	-	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	-	-	-	-	-	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	-	-	-	-	-	<200	<200
F3-PAH	µg/g	-	-	-	-	-	-	-	-	-	-	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	-	-	-	-	-	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	-	-	-	-	-	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.032	<0.005	0.021	0.024	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.098	<0.004	0.075	0.085	<0.004	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.056	<0.01	0.072	0.08	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.128	<0.01	0.094	0.101	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.302	<0.01	0.22	0.215	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.452	<0.02	0.263	0.295	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.13	<0.01	0.094	0.092	<0.01	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	0.142	<0.01	0.129	0.123	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.032	<0.005	0.02	0.019	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.168	<0.01	0.14	0.101	<0.01	<0.01	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.208	<0.02	0.118	0.117	<0.02	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	0.04	<0.02	0.026	0.022	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.166	<0.02	0.149	0.149	<0.02	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.2355	<0.01	0.1683	0.1746	<0.01	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.707	0.03	0.505	0.524	0.03	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**3.57**	<0.0625	**2.67**	**2.66**	<0.0625	<0.0625	<0.0625
Laboratory Identification Number							7052560_7052560-61	7052560_7052560-57	7052560_7052560-69	7052560_7052560-74	7052560_7052560-65	7060116_7060116-17	7060116_7060116-18

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP28E2 SA#1	16TP28E2 SA#2	16TP28N1 SA#1	16TP28N1 SA#2	16TP28S1 SA#1	16TP28S1 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP28E2 SA#1 D=0.15m	16TP28E2 SA#2 D=0.4m	16TP28N1 SA#1 D=0.15m	16TP28N1 SA#2 D=0.4m	16TP28S1 SA#1 D=0.15m	16TP28S1 SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	3.2	4.9	2.5	5	3.7	5.4
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.03	0.03	0.03	0.03	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625
Laboratory Identification Number							7060116_7060116-13	7060116_7060116-14	7060116_7060116-01	7060116_7060116-02	7060116_7060116-05	7060116_7060116-06

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use. Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP28W1 SA#1	16TP28W1 SA#2	16TP30E1 SA#1	16TP30E1 SA#2	16TP30E2 SA#1	16TP30E2 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP28W1 SA#1 D=0.15m	16TP28W1 SA#2 D=0.4m	16TP30E1 SA#1 D=0.15m	16TP30E1 SA#2 D=0.4m	16TP30E2 SA#1 D=0.15m	16TP30E2 SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	3.8	2.2	5.1	8.5	28.7	14.6
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.019	<0.005	<0.005	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.079	<0.004	<0.004	<0.004	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.045	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.092	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.177	<0.01	<0.01	<0.01	0.011	0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.59	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.076	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	0.078	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.026	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.064	<0.01	<0.01	<0.01	0.01	0.011
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.124	<0.02	<0.02	<0.02	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.071	<0.02	<0.02	<0.02	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.166	<0.01	<0.01	<0.01	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.498	0.03	0.03	0.03	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**2.25**	<0.0625	<0.0625	<0.0625	0.0711	0.063
Laboratory Identification Number							7060116_7060116-09	7060116_7060116-10	7060116_7060116-37	7060116_7060116-38	7060116_7060116-33	7060116_7060116-34

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP30S1 SA#1	16TP30S1 SA#2		16TP30W1 SA#1	16TP30W1 SA#2	16TP30W2 SA#1	16TP30W2 SA#2
							0.15 m	0.4 m		0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017		5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP30S1 SA#1 D=0.15m	16TP30S1 SA#2 D=0.4m	Dupe #5	16TP30W1 SA#1 D=0.15m	16TP30W1 SA#2 D=0.4m	16TP30W2 SA#1 D=0.15m	16TP30W2 SA#2 D=0.4m
Physical Parameters													
Moisture	%	-	-	-	-	-	7.1	4.1	5.6	5.1	4.5	16.6	20.6
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	0.022	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	0.006	<0.005	0.007	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.476	<0.005	<0.005	0.021	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.864	0.005	0.004	0.057	0.027	0.009	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.244	<0.01	<0.01	0.023	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.53	<0.01	<0.01	0.037	0.015	0.012	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.59	<0.01	<0.01	0.098	0.031	0.029	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	1.02	0.038	<0.02	0.132	0.059	<0.02	<0.021
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.257	<0.01	<0.01	0.039	0.013	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	0.233	<0.01	<0.01	0.052	0.018	0.017	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.132	0.028	<0.005	0.01	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.344	<0.01	<0.01	0.062	0.022	0.023	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.586	0.028	<0.02	0.056	0.024	<0.02	<0.021
Naphthalene	µg/g	0.013	0.013	5	5	50	**0.057**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	**0.088**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.021
Pyrene	µg/g	10	100	10	10	100	0.359	<0.02	<0.02	0.054	0.024	0.02	<0.021
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.871	0.0314	<0.01	0.0749	0.0242	0.0157	<0.0105
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				2.613	0.0942	0.03	0.2247	0.0726	0.0471	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**10.3**	0.139	<0.0625	**1.38**	0.425	0.283	<0.0656
Laboratory Identification Number							7060116_7060116-21	7060116_7060116-22	7060116_7060116-AJ	7060116_7060116-29	7060116_7060116-30	7060116_7060116-25	7060116_7060116-26

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP34E1 SA#1	16TP34E1 SA#2	16TP34E2 SA#1	16TP34E2 SA#2	16TP34N1 SA#1	16TP34N1 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP34E1 SA#1 D=0.15m	16TP34E1 SA#2 D=0.4m	16TP34E2 SA#1 D=0.15m	16TP34E2 SA#2 D=0.4m	16TP34N1 SA#1 D=0.15m	16TP34N1 SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	7.1	8.6	5.1	4.6	3	5.1
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	-	<100	-	<100	-
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	-	<100	-	<100	-
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	-	<200	-	<200	-
F3-PAH	µg/g	-	-	-	-	-	<200	-	<200	-	<200	-
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	-	<200	-	<200	-
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	-	YES	-	YES	-
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.03	<0.005	<0.005	<0.005	0.026	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.149	<0.004	<0.004	<0.004	0.115	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.599	<0.01	<0.01	<0.01	0.039	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.505	<0.01	<0.01	<0.01	0.093	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.87	<0.01	<0.01	<0.01	0.233	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.431	<0.02	<0.02	<0.02	0.362	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.4	<0.01	<0.01	<0.01	0.093	<0.01
Chrysene	µg/g	-	-	-	-	-	0.739	<0.01	<0.01	<0.01	0.098	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.105	<0.005	0.006	<0.005	0.033	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.8	<0.01	<0.01	<0.01	0.118	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.361	<0.02	<0.02	<0.02	0.177	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	0.041	<0.02	<0.02	<0.02	0.028	<0.02
Pyrene	µg/g	10	100	10	10	100	1.1	<0.02	<0.02	<0.02	0.115	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.881	<0.01	<0.01	<0.01	0.194	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				2.643	0.03	0.03	0.03	0.582	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**14.3**	<0.0656	<0.0656	<0.0656	**3.29**	<0.0656
Laboratory Identification Number							7060116_7060116-53	7060116_7060116-54	7060116_7060116-49	7060116_7060116-50	7060116_7060116-41	7060116_7060116-42

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP34S1 SA#1	16TP34S1 SA#2	16TP34W1 SA#1	16TP34W1 SA#2	16TP34W2 SA#1	16TP34W2 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP34S1 SA#1 D=0.15m	16TP34S1 SA#2 D=0.4m	16TP34W1 SA#1 D=0.15m	16TP34W1 SA#2 D=0.4m	16TP34W2 SA#1 D=0.15m	16TP34W2 SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	2.9	3.6	3.9	3.8	10	5.9
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	-	<100	-	<100	-
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	-	<100	-	<100	-
F3 (C16-C34)	µg/g	300	1700	-	-	-	205	-	<200	-	<200	-
F3-PAH	µg/g	-	-	-	-	-	<200	-	<200	-	<200	-
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	-	<200	-	<200	-
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	-	YES	-	YES	-
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.119	<0.005	<0.005	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.365	0.005	<0.004	<0.004	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.239	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.573	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	**1.25**	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	3.09	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.496	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	0.583	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.149	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.69	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.897	<0.02	<0.02	<0.02	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	**0.086**	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.772	<0.02	<0.02	<0.02	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	1.09	<0.01	<0.01	<0.01	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				3.27	0.03	0.03	0.03	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**17.9**	<0.0656	<0.0625	<0.0656	<0.0625	<0.0656
Laboratory Identification Number							7060116_7060116-45	7060116_7060116-46	7060116_7060116-61	7060116_7060116-62	7060116_7060116-57	7060116_7060116-58

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP37E1 SA#1	16TP37E1 SA#2	16TP37E2 SA#1	16TP37E2 SA#2	16TP37N1 SA#1	16TP37N1 SA#2	
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	
							16TP37E1 SA#1 D=0.15m	16TP37E1 SA#2 D=0.4m	16TP37E2 SA#1 D=0.15m	16TP37E2 SA#2 D=0.4m	16TP37N1 SA#1 D=0.15m	16TP37N1 SA#2 D=0.4m	Dupe #6
Physical Parameters													
Moisture	%	-	-	-	-	-	3.3	7.2	5.7	8.1	2.5	2.9	3.1
Hydrocarbons				-	-	-							
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)													
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.007	<0.005	<0.005	<0.005	0.006	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.032	0.011	<0.004	<0.004	0.028	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.016	<0.01	<0.01	<0.01	0.011	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.033	0.01	<0.01	<0.01	0.022	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.12	0.022	<0.01	<0.01	0.051	<0.01	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.124	0.033	<0.02	<0.02	0.165	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.047	<0.01	<0.01	<0.01	0.022	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	0.052	0.013	<0.01	<0.01	0.026	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.011	<0.005	<0.005	<0.005	0.009	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.051	0.014	<0.01	<0.01	0.032	<0.01	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.066	<0.02	<0.02	<0.02	0.05	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.047	<0.02	<0.02	<0.02	0.035	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.0754	0.0131	<0.01	<0.01	0.0485	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.2262	0.0393	0.03	0.03	0.1455	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**1.59**	0.179	<0.0625	<0.0625	0.777	<0.0625	<0.0625
Laboratory Identification Number							7060116_7060116-85	7060116_7060116-86	7060116_7060116-81	7060116_7060116-82	7060116_7060116-65	7060116_7060116-66	7060116_7060116-AK

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP37S1 SA#1	16TP37S1 SA#2	16TP37W1 SA#1	16TP37W1 SA#2	16TP37W2 SA#1	16TP37W2 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP37S1 SA#1 D=0.15m	16TP37S1 SA#2 D=0.4m	16TP37W1 SA#1 D=0.15m	16TP37W1 SA#2 D=0.4m	16TP37W2 SA#1 D=0.15m	16TP37W2 SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	4	3.3	4.5	6.5	7	6.1
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.131	0.007	0.019	0.011	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.5	0.03	0.071	0.049	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.084	<0.01	0.037	0.028	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.15	<0.01	0.078	0.056	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.273	<0.01	0.212	0.192	<0.01	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	1.48	0.029	0.282	0.23	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.105	<0.01	0.09	0.075	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	0.126	<0.01	0.106	0.077	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.041	<0.005	0.023	0.021	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.225	<0.01	0.139	0.062	<0.01	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.263	<0.02	0.126	0.115	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	0.013	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	0.043	<0.02	0.035	0.021	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.276	<0.02	0.123	0.063	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.291	<0.01	0.161	0.128	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.873	0.03	0.483	0.384	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**4.23**	<0.0625	**3**	**2.56**	<0.0625	<0.0625
Laboratory Identification Number							7060116_7060116-69	7060116_7060116-70	7060116_7060116-77	7060116_7060116-78	7060116_7060116-73	7060116_7060116-74

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP39E1 SA#1	16TP39E1 SA#2	16TP39E2 SA#1	16TP39E2 SA#2	16TP39N1 SA#1	16TP39N1 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP39E1 SA#1 D=0.15m	16TP39E1 SA#2 D=0.4m	16TP39E2 SA#1 D=0.15m	16TP39E2 SA#2 D=0.4m	16TP39N1 SA#1 D=0.15m	16TP39N1 SA#2 D=0.4m
Physical Parameters												
Moisture	%	-	-	-	-	-	13.6	9.2	8.8	3.8	4.4	3.5
Hydrocarbons				-	-	-						
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200	988	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200	987	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-methylnaphthalene	µg/g	-	-	-	-	-	0.53	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.007	<0.005	<0.005	<0.005	0.03	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.039	<0.004	0.005	<0.004	0.138	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.023	<0.01	<0.01	<0.01	0.059	<0.01
Benzo(a)pyrene	µg/g	20	72	1 #1	1 #1	10 #1	0.053	<0.01	<0.01	<0.01	0.11	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.126	<0.01	0.015	<0.01	0.279	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.088	<0.02	<0.02	<0.02	0.718	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.045	<0.01	<0.01	<0.01	0.1	<0.01
Chrysene	µg/g	-	-	-	-	-	0.077	<0.01	<0.01	<0.01	0.12	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.012	<0.005	<0.005	<0.005	0.034	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.06	<0.01	<0.01	<0.01	0.165	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	0.018	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.051	<0.02	<0.02	<0.02	0.234	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	**0.271**	<0.01	<0.01	<0.01	**0.019**	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	**0.244**	<0.02	<0.02	<0.02	**0.065**	<0.02
Pyrene	µg/g	10	100	10	10	100	0.075	<0.02	<0.02	<0.02	0.17	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.0953	<0.01	<0.01	<0.01	0.229	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.2859	0.03	0.03	0.03	0.687	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**1.67**	<0.0625	0.0955	<0.0625	**3.86**	<0.0625
Laboratory Identification Number							7060116_7060116-AF	7060116_7060116-AG	7060116_7060116-AB	7060116_7060116-AC	7060116_7060116-89	7060116_7060116-90

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 1: Soil Analytical Results - Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP39W1 SA#1	16TP39W1 SA#2	16TP39W2 SA#1	16TP39W2 SA#2
							0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP39W1 SA#1 D=0.15m	16TP39W1 SA#2 D=0.4m	16TP39W2 SA#1 D=0.15m	16TP39W2 SA#2 D=0.4m
Physical Parameters										
Moisture	%	-	-	-	-	-	6.2	7	11.4	7.4
Hydrocarbons				-	-	-				
F2 (C10-C16)	µg/g	150	260	-	-	-	<100	<100	<100	<100
F2-NAPHTHALENE	µg/g	-	-	-	-	-	<100	<100	<100	<100
F3 (C16-C34)	µg/g	300	1700	-	-	-	<200	<200	<200	<200
F3-PAH	µg/g	-	-	-	-	-	<200	<200	<200	<200
F4 (C34-C50)	µg/g	2800	3300	-	-	-	<200	<200	<200	<200
Reached Baseline at C_{50}	N/A	-	-	-	-	-	YES	YES	YES	YES
Polycyclic Aromatic Hydrocarbons (PAHs)										
2-methylnaphthalene	µg/g	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Acenaphthene	µg/g	0.28	0.28	-	-	-	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	µg/g	320	320	-	-	-	0.018	<0.005	<0.005	<0.005
Anthracene	µg/g	2.5	32	-	-	-	0.067	0.02	<0.004	<0.004
Benz(a)anthracene	µg/g	1	10	1	1	10	0.029	<0.01	<0.01	<0.01
Benzo(a)pyrene	µg/g	20	72	1 [#1]	1 [#1]	10 [#1]	0.07	0.022	<0.01	<0.01
Benzo(b)fluoranthene	µg/g	1	10	1	1	10	0.179	0.052	<0.01	<0.01
Benzo(g,h,i)perylene	µg/g	-	-	-	-	-	0.299	0.072	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	1	10	1	1	10	0.07	0.019	<0.01	<0.01
Chrysene	µg/g	-	-	-	-	-	0.076	0.022	<0.01	<0.01
Dibenz(a,h)anthracene	µg/g	1	10	1	1	10	0.02	0.005	<0.005	<0.005
Fluoranthene	µg/g	50	180	-	-	-	0.086	0.026	0.014	<0.01
Fluorene	µg/g	0.25	0.25	-	-	-	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	µg/g	1	10	1	1	10	0.126	0.033	<0.02	<0.02
Naphthalene	µg/g	0.013	0.013	5	5	50	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/g	0.046	0.046	5	5	50	<0.02	<0.02	<0.02	<0.02
Pyrene	µg/g	10	100	10	10	100	0.084	0.024	<0.02	<0.02
B(a)P Total Potency Equivalent	µg/g	5.3	5.3	-	-	-	0.142	0.0405	<0.01	<0.01
B[a]P TPE multiplied by 3*	µg/g	5.3	5.3				0.426	0.1215	0.03	0.03
IACR (CCME)	µg/g	1	1	-	-	-	**2.5**	0.689	<0.0625	<0.0625
Laboratory Identification Number							7060116_7060116-97	7060116_7060116-98	7060116_7060116-93	7060116_7060116-94

NOTES:

#1	CSR Schedule 5 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
*	As the site has the potential of soil contaminated by creosote the calculated B(a)P TPE was multiplied by a safety factor of three as per CCME guidance (2010).
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use.
	Canadian Council of Ministers of the Environment (CCME) (2008). Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil, for coarse soils under Residential/Parkland and Commercial land use.
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
B[a]P TPE	Benzo[a]Pyrene (B[a]P) Total Potency Equivalent (TPE) relative to benzo(a)pyrene which is determined by adding the products of the measured concentrations of each listed PAH in the CCME PAH 2010 guideline multiplied by the TPE listed.
B[a]P TPE =	(benzo(a)anthracene)(0.1)+(benzo(a)pyrene)(1.0)+(benzo(b)fluoranthene)(0.1)+(benzo(k)fluoranthene)(0.1)+(Benzo(g)perylene)(0.01)+(chrysene)(0.01)+(dibenz(a,h)anthracene)(1)+(indeno(1,2,3-cd)pyrene)(0.1).
IACR	Calculated risk of Index of additive Cancer Risk (IACR) which is determined by adding the measured concentrations of each listed PAH in the CCME PAH 2010 guideline divided by the soil quality guideline listed.
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil. - Toxicity to soil invertebrates and plants. - Groundwater used for drinking water. - Groundwater flow to surface water used by freshwater aquatic life. Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP02E1 SA#1	16TP02E1 SA#2	16TP02E2 SA#1	16TP02E2 SA#2	16TP02W1 SA#1		16TP02W1 SA#2
							0.15 m	0.4	0.15 m	0.4 m	0.15 m	0.15 m	0.4 m
							5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017		5/29/2017
							16TP02E1 SA#1 D=0.15m	16TP02E1 SA#2 D=0.4m	16TP02E2 SA#1 D=0.15m	16TP02E2 SA#2 D=0.4m	16TP02W1 SA#1 D=0.15m	DUP #1	16TP02W1 SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	7.7	7.4	7.4	7.7	8	7.9	7.4
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.38	0.14	0.13	<0.1	0.66	0.63	<0.1
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	2.92	1.66	1.79	1.44	3.97	4.08	1.55
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	98.4	115	114	92.5	102	94.1	125
Beryllium	µg/g	4	8	4	4	8	0.42	0.66	0.58	0.58	0.37	0.34	0.64
Boron_	µg/g	-	-	-	-	-	<2	2.1	2.8	<2	2.3	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.3	0.135	0.171	0.105	0.424	0.408	0.146
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	35.1	33.1	32.8	32.1	41	36.5	34.9
Cobalt	µg/g	50	300	50	50	300	11.4	14.2	14	13.6	12.4	11.6	14.6
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	**84.5**	19.4	21.1	15.1	**96.8**	**86.5**	19.2
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	11.3	4.26	5.7	3.73	15.8	14.1	4.27
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	11.7	10.7	9.76	10.3	14.3	13.3	10.5
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	511	749	728	677	521	483	789
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	1.21	0.99	0.92	0.73	1.49	1.46	1.01
Nickel	µg/g	45	89	100	100	500	27.6	24.9	24.3	24.7	32.6	30.8	25.1
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	40.3	58.8	63.3	47.9	39.6	40.5	65.6
Thallium	µg/g	1	1	-	-	-	0.14	0.11	0.1	0.11	0.16	0.14	0.11
Tin	µg/g	50	300	50	50	300	1	0.72	0.77	0.66	1.45	1.31	0.72
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.779	1.21	0.961	0.95	0.828	0.673	1.05
Vanadium	µg/g	130	130	200	200	-	50.9	56.3	55.7	55.5	57.5	51.8	57.9
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	78.3	83.7	82.0	63.3	75.6	75.6	92.3
Laboratory Identification Number							7052353_7052353-05	7052353_7052353-06	7052353_7052353-01	7052353_7052353-02	7052353_7052353-13	7052353_7052353-41	7052353_7052353-14

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP02W2 SA#1	16TP02W2 SA#2	16TP04E1 SA#1	16TP04E1 SA#2	16TP04E2 SA#1	16TP04E2 SA#2	16TP04W1 SA#1
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m
							5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/29/2017
							16TP02W2 SA#1 D=0.15m	16TP02W2 SA#2 D=0.4m	16TP04E1 SA#1 D=0.15m	16TP04E1 SA#2 D=0.4m	16TP04E2 SA#1 D=0.15m	16TP04E2 SA#2 D=0.4m	16TP04W1 SA#1 D=0.15m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	7	7.3	8	7.8	6.8	7	8
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.13	0.12	0.33	0.13	<0.1	<0.1	0.45
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	1.78	1.71	3.03	1.44	1.15	1.08	3.79
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	105	94.1	99.4	54.3	50	66.1	112
Beryllium	µg/g	4	8	4	4	8	0.52	0.57	0.35	0.35	0.36	0.38	0.36
Boron_	µg/g	-	-	-	-	-	2.8	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.158	0.112	0.413	0.101	0.071	0.059	0.418
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	29.6	33.9	34.4	20.1	20.1	23.9	42.8
Cobalt	µg/g	50	300	50	50	300	12.4	13.3	11.5	8.82	8.7	9.61	11.1
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	28.9	20.3	**94.7**	16	10.2	9.78	58
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	7.66	5.22	8.49	4.3	2.42	1.73	23.3
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	9.25	10.2	12.4	6.9	6.88	5.77	14.7
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	661	657	471	441	410	403	463
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.97	0.83	1.11	0.81	0.71	0.79	1.12
Nickel	µg/g	45	89	100	100	500	21.9	24	31	16.2	13.9	17.8	33.8
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	56.1	50.4	41.5	30.7	31.4	41.1	51.1
Thallium	µg/g	1	1	-	-	-	<0.1	0.1	0.14	<0.1	<0.1	<0.1	0.19
Tin	µg/g	50	300	50	50	300	0.73	0.76	0.85	0.44	0.49	0.55	1.21
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.821	0.913	0.804	0.748	0.71	0.584	0.654
Vanadium	µg/g	130	130	200	200	-	49.9	55.9	52	41.4	44.8	44.5	55.1
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	78.9	65.3	74.9	53.9	48.5	46.1	70.5
Laboratory Identification Number							7052353_7052353-09	7052353_7052353-10	7052353_7052353-21	7052353_7052353-22	7052353_7052353-17	7052353_7052353-18	7052560_7052560-14

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP04W1 SA#2	16TP04W2 SA#1	16TP04W2 SA#2	16TP14E1SA#1	16TP14E1SA#2	16TP14E2SA#1	16TP14E2SA#2
							0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/29/2017	5/29/2017	5/29/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017
							16TP04W1 SA#2 D=0.4m	16TP04W2 SA#1 D=0.15m	16TP04W2 SA#2 D=0.4m	16TP14E1SA#1 D=0.15m	16TP14E1SA#2 D=0.4m	16TP14E2SA#1 D=0.15m	16TP14E2SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	7.9	6.7	7.1	**8.1**	7.6	7.7	7.2
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.1	0.12	<0.1	0.43	0.18	<0.1	<0.1
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	1.44	1.5	1.15	3.55	1.57	1.5	1.11
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	63.1	66.9	49.5	84.8	90.2	75.5	72.7
Beryllium	µg/g	4	8	4	4	8	0.37	0.34	0.44	0.22	0.42	0.37	0.33
Boron_	µg/g	-	-	-	-	-	<2	2.2	<2	<2	<2	2.8	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.116	0.135	0.081	0.412	0.175	0.145	0.125
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	21.6	19.5	22.8	32.6	28.4	22.9	21.3
Cobalt	µg/g	50	300	50	50	300	8.79	8.4	9.75	9.13	11.9	10.3	9.37
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	14.6	34.6	12.6	**134**	19.9	26.4	15
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	3.63	9.52	2.17	13.6	4.7	4.75	2.86
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	7.53	6.19	7.27	9.43	7.76	6.65	5.76
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	443	440	518	369	569	485	430
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	0.046	<0.04	0.041
Molybdenum	µg/g	10	40	10	10	40	0.69	0.88	1.11	1.62	0.92	1.07	0.64
Nickel	µg/g	45	89	100	100	500	16.5	13.8	18.4	30.3	22.1	18.4	17.4
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	36.9	43.2	33.6	39.3	52.9	45.5	46
Thallium	µg/g	1	1	-	-	-	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1
Tin	µg/g	50	300	50	50	300	0.44	0.57	0.51	1.1	0.63	0.57	0.48
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.866	0.684	0.675	0.677	1.09	0.749	0.705
Vanadium	µg/g	130	130	200	200	-	43.5	39.2	43.2	45.1	50.7	44.4	43.1
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	52.3	64	52.5	62.7	89.9	69.5	68
Laboratory Identification Number							7052560_7052560-21	7052560_7052560-22	7052560_7052560-17	7052560_7052560-73	7052560_7052560-18	7052560_7052560-01	7052560_7052560-02

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP14W1SA#1		16TP14W1SA#2	16TP14W1SA#3	16TP14W2SA#1	16TP14W2SA#2	16TP14N1 SA#1
							0.15 m		0.4 m	0.7 m	0.15 m	0.4 m	0.15 m
							5/30/2017		5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/29/2017
							16TP14W1SA#1 D=0.15m	DUP #3	16TP14W1SA#2 D=0.4m	16TP14W1SA#3 D=0.7m	16TP14W2SA#1 D=0.15m	16TP14W2SA#2 D=0.4m	16TP04N1 SA#1 D=0.15m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	7.9	7.8	7.6	7.5	7	7.3	**8.6**
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.32	0.44	0.36	0.11	0.15	<0.1	0.68
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	3.22	3.5	3.3	1.39	1.85	1.41	4.73
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	71.8	91.5	95	62.1	73	44.4	101
Beryllium	µg/g	4	8	4	4	8	0.23	0.23	0.36	0.39	0.36	0.33	0.3
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2.0	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.354	0.41	0.331	0.122	0.156	0.07	0.428
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	32.6	32.8	34.9	26.7	24.7	18.5	41.3
Cobalt	µg/g	50	300	50	50	300	8.71	9.73	11.9	11	10.5	8.58	10.4
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	**87.8**	**120**	**77.5**	16.7	57	9.97	**68.6**
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	11.9	14.9	11.3	3.22	7.65	2.68	13.8
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	10.1	8.98	9.62	6.72	7.11	5.24	14.4
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	360	384	497	504	492	408	433
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	0.046	<0.040	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	1.51	1.79	1.19	0.77	0.99	0.9	1.51
Nickel	µg/g	45	89	100	100	500	23.8	27.8	26.7	20.2	20.8	14.3	33.6
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.50	<0.5	<0.5	0.5
Silver	mg/kg	20	40	20	20	40	0.22	0.21	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	28.9	29.2	40.9	37.4	41.3	26.3	41.3
Thallium	µg/g	1	1	-	-	-	0.13	0.15	0.15	<0.10	<0.1	<0.1	0.18
Tin	µg/g	50	300	50	50	300	0.91	1.24	1	0.57	0.73	0.46	1.92
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.758	0.887	1.22	0.852	1.32	1.07	1.13
Vanadium	µg/g	130	130	200	200	-	47.2	45.7	51	53.3	44	53.8	52.2
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	59.5	66	74.6	70.5	70	49.8	63.7
Laboratory Identification Number							7052353_7052353-33	7052353_7052353-34	7052353_7052353-42	7052560_7052560-19	7052353_7052353-37	7052353_7052353-38	7052353_7052353-29

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
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Site specific factors include:	- Intake of contaminated soil.
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	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP14N1 SA#2		16TP14S1 SA#1	16TP14S1 SA#2	16TP16E1SA#1	16TP16E1SA#2	16TP16E2SA#1
							0.4 m		0.15 m	0.4 m	0.15	0.4 m	0.15 m
							5/29/2017	5/29/2017	5/29/2017	5/29/2017	5/30/2017	5/30/2017	5/30/2017
							16TP04N1 SA#2 D=0.4m	DUP #2	16TP04S1 SA#1 D=0.15m	16TP04S1 SA#2 D=0.4m	16TP16E1SA#1 D=0.15m	16TP16E1SA#2 D=0.4m	16TP16E2SA#1 D=0.15m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	7.7	8	**8.4**	**8.3**	**8.1**	7.8	6.8
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	<0.1	<0.1	0.65	0.17	0.42	0.15	0.14
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	1.34	1.67	3.75	2.96	4.54	1.58	1.73
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	75.1	72.8	80.8	83.5	89.7	63.2	60.6
Beryllium	µg/g	4	8	4	4	8	0.4	0.37	0.27	0.31	0.26	0.37	0.29
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.162	0.158	0.34	0.321	0.395	0.116	0.132
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	22.9	23.2	32	33	28.7	25.4	21
Cobalt	µg/g	50	300	50	50	300	9.72	9.13	7.88	9.49	9.02	11.1	8.83
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	14.7	15.3	**81.4**	28.9	**63.1**	17.2	32.2
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	3.16	3.29	13.5	3.85	11.5	2.91	6.8
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	7.63	7.55	11.2	12.9	11.6	6.43	5.42
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	549	449	350	398	409	466	408
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.92	0.82	1.66	0.78	0.96	0.7	0.86
Nickel	µg/g	45	89	100	100	500	17.1	16.5	24.7	25	23.4	18.4	16
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	0.53	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	45.5	45.3	44.5	54.3	34.4	35.6	46.1
Thallium	µg/g	1	1	-	-	-	<0.1	<0.1	0.14	0.16	0.16	<0.1	<0.1
Tin	µg/g	50	300	50	50	300	0.5	0.49	1.63	0.43	0.88	0.58	0.58
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.913	0.856	1.61	0.864	0.62	0.719	0.625
Vanadium	µg/g	130	130	200	200	-	43.1	43.9	42.9	47.9	47.1	49.6	42.3
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	80.1	67.3	54.9	64.6	58.9	57.8	54.6
Laboratory Identification Number							7052353_7052353-30	7052353_7052353-25	7052353_7052353-26	7052560_7052560-13	7052560_7052560-09	7052560_7052560-10	7052560_7052560-05

NOTES:

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	- Groundwater flow to surface water used by freshwater aquatic life.
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Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP16E2SA#2	16TP16N1SA#1	16TP16N1SA#2	16TP16S1SA#1	16TP16S1SA#2	16TP16W1SA#1	16TP16W1SA#2
							0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017
							16TP16E2SA#2 D=0.4m	16TP16N1SA#1 D=0.15m	16TP16N1SA#2 D=0.4m	16TP16S1SA#1 D=0.15m	16TP16S1SA#2 D=0.4m	16TP16W1SA#1 D=0.15m	16TP16W1SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	7.2	**8.2**	**8.6**	**8.2**	**8.4**	**8.1**	8
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	<0.1	0.44	0.3	0.58	0.19	0.31	0.22
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	1.17	4.77	5.03	4.47	3.34	3.77	2.92
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	50.1	107	86.9	86.8	82.9	68	69.7
Beryllium	µg/g	4	8	4	4	8	0.26	0.29	0.27	0.21	0.3	0.23	0.24
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.05	0.512	0.506	0.43	0.288	0.422	0.242
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	18.9	45.7	43.5	33.8	31	35.9	21.7
Cobalt	µg/g	50	300	50	50	300	8.18	11.6	12.3	9.02	11.5	10.2	8.56
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	8.63	42.1	41	**71.4**	26.4	**136**	23.9
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	1.71	7.12	4.55	16.3	4.29	13.9	4.74
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	5.44	12	13	11.4	9.86	10.4	8.08
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	364	444	398	394	443	351	392
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	0.041	0.069	0.042	0.047	0.041
Molybdenum	µg/g	10	40	10	10	40	0.64	1.16	1.5	1.3	1.03	1.38	0.65
Nickel	µg/g	45	89	100	100	500	13.2	34.2	36.6	27	27.3	29.5	17.3
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	0.57	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	0.23	<0.2	<0.2	<0.2	0.23	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	27.4	37.8	34.4	25	34.6	32.7	31.5
Thallium	µg/g	1	1	-	-	-	<0.1	0.21	0.2	0.19	0.16	0.17	0.11
Tin	µg/g	50	300	50	50	300	0.41	0.87	0.35	2.81	0.52	0.65	0.5
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	1.31	0.61	0.728	0.741	0.714	0.795	0.788
Vanadium	µg/g	130	130	200	200	-	39.3	56.1	58.3	48.4	53.8	47.1	41.7
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	43.2	76.2	66.3	62	65.7	57.2	51.3
Laboratory Identification Number							7052560_7052560-06	7052560_7052560-33	7052560_7052560-34	7052560_7052560-37	7052560_7052560-38	7052560_7052560-29	7052560_7052560-30

NOTES:

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Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP16W2SA#1	16TP16W2SA#2	16TP17E1SA#1	16TP17E1SA#2	16TP17E2SA#1	16TP17E2SA#2	16TP17W1SA#1
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m
							5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017
							16TP16W2SA#1 D=0.15m	16TP16W2SA#2 D=0.4m	16TP17E1SA#1 D=0.15m	16TP17E1SA#2 D=0.4m	16TP17E2SA#1 D=0.15m	16TP17E2SA#2 D=0.4m	16TP17W1SA#1 D=0.15m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	6.9	7	8	**8.1**	7.4	7.3	7.9
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	<0.1	<0.1	0.27	0.3	1.22	<0.1	0.17
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	1.17	1.23	3.45	3.39	2.82	0.97	3.25
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	53.2	64.4	71.9	78.8	82.5	42.9	52.1
Beryllium	µg/g	4	8	4	4	8	0.3	0.34	0.24	0.23	0.32	0.25	0.18
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.068	0.062	0.354	0.307	0.305	0.05	0.338
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	19.7	22.1	30	29.1	27.4	19	31.4
Cobalt	µg/g	50	300	50	50	300	8.73	10.2	9.18	9.06	10.7	7.99	8.43
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	11.3	11.9	54	41.1	36.3	9.54	**72.1**
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	2.68	2.69	9.43	7.36	38.5	1.78	10.1
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	5.84	5.94	9.97	10.2	6.84	4.72	10.9
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	398	507	382	401	473	331	316
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	0.042	<0.04	<0.04	0.495	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.76	0.8	1.05	0.85	1.06	0.67	1
Nickel	µg/g	45	89	100	100	500	14.5	17.1	24.6	22.8	21	13.7	22.8
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	34.5	38.3	29.2	29.6	38.1	28.5	27.4
Thallium	µg/g	1	1	-	-	-	<0.1	<0.1	0.14	0.14	<0.1	<0.1	0.13
Tin	µg/g	50	300	50	50	300	0.51	0.5	0.75	0.72	0.82	0.49	0.48
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.752	0.868	0.704	0.694	0.789	0.588	1.23
Vanadium	µg/g	130	130	200	200	-	38.3	45.3	43.7	44.7	46.5	38.1	41.9
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	46.6	47.4	59.4	55.1	**506**	43.6	50.8
Laboratory Identification Number							7052560_7052560-25	7052560_7052560-26	7052560_7052560-53	7052560_7052560-54	7052560_7052560-49	7052560_7052560-50	7052560_7052560-45

NOTES:

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Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP17W1SA#2	16TP17W2SA#1	16TP17W2SA#2	16TP22E1SA#1	16TP22E1SA#2	16TP22E2SA#1	16TP22E2SA#2
							0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017	5/30/2017
							16TP17W1SA#2 D=0.4m	16TP17W2SA#1 D=0.15m	16TP17W2SA#2 D=0.4m	16TP22E1SA#1 D=0.15m	16TP22E1SA#2 D=0.4m	16TP22E2SA#1 D=0.15m	16TP22E2SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	**8.5**	7	7	**8.2**	7.7	7.9	**9.1**
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.44	<0.1	<0.1	0.55	0.11	<0.1	<0.1
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	4.11	1.08	1.47	4.21	1.16	1.08	0.91
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	72.9	63.6	63.7	78.6	58.6	52.5	56
Beryllium	µg/g	4	8	4	4	8	0.21	0.26	0.38	0.21	0.27	0.26	0.2
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.348	0.077	0.08	0.416	0.071	0.079	0.063
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	26.6	19.7	23.8	28.3	19.6	19.2	15.9
Cobalt	µg/g	50	300	50	50	300	8.06	8.41	10.9	8.6	8.49	8.45	7.48
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	30.5	10.8	11.8	**83.4**	10.2	11.5	7.96
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	21.6	6.09	3.11	13.3	2.25	2.24	1.44
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	10.9	5.5	6.5	10.8	5.12	4.79	4.12
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	375	358	540	393	353	342	329
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	0.042	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.8	0.76	1.09	1.33	0.65	0.6	0.67
Nickel	µg/g	45	89	100	100	500	20.5	14.7	19.3	24.4	14	15.8	12.2
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	30.1	41.2	32.4	33.4	38.9	31.5	30.7
Thallium	µg/g	1	1	-	-	-	0.14	<0.1	<0.1	0.15	<0.1	<0.1	<0.1
Tin	µg/g	50	300	50	50	300	0.93	0.58	0.51	1.3	0.49	0.45	0.42
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.677	0.564	0.952	0.724	0.648	0.531	0.372
Vanadium	µg/g	130	130	200	200	-	47.6	38.9	47.3	47	39	37.7	35
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	54.4	57.6	53	62.7	40.5	43.9	37.7
Laboratory Identification Number							7052560_7052560-46	7052560_7052560-41	7052560_7052560-42	7052560_7052560-61	7052560_7052560-62	7052560_7052560-57	7052560_7052560-58

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP22W1SA#1		16TP22W1SA#2	16TP22W2SA#1	16TP22W2SA#2	16TP28E1 SA#1	16TP28E1 SA#2
							0.15 m		0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/30/2017		5/30/2017	5/30/2017	5/30/2017	5/31/2017	5/31/2017
							16TP22W1SA#1 D=0.15m	DUP #4	16TP22W1SA#2 D=0.4m	16TP22W2SA#1 D=0.15m	16TP22W2SA#2 D=0.4m	16TP28E1 SA#1 D=0.15m	16TP28E1 SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	**8.2**	**8.3**	**8.1**	7.5	7.4	8	6.9
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.45	0.41	0.15	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	4.19	3.9	2.39	1.15	1.31	1.97	1.82
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	85.7	79.9	66.1	56.5	52.4	52.5	83
Beryllium	µg/g	4	8	4	4	8	0.21	0.21	0.28	0.25	0.25	0.35	0.54
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.467	0.428	0.218	0.102	0.075	0.121	0.104
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	32.2	33.8	29.8	19.2	19.3	22.5	27.5
Cobalt	µg/g	50	300	50	50	300	9.71	8.96	9.78	8.36	8.84	8.18	11.3
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	**96.1**	**84.5**	22	30.9	14.3	19.5	17.6
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	13.1	12	3.65	4.24	3.72	2.89	3.31
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	10.3	9.89	7.93	4.92	4.9	8.32	9.31
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	386	378	379	370	362	366	523
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	1.45	1.33	0.83	1.28	0.64	0.55	0.68
Nickel	µg/g	45	89	100	100	500	28.6	26.1	21.2	14.8	14.2	17.9	23.4
Selenium	µg/g	1	2.9	3	3	10	0.51	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	0.23	0.21	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	32.6	30.9	27.3	36.3	29.8	35.6	41.4
Thallium	µg/g	1	1	-	-	-	0.18	0.16	0.12	<0.1	<0.1	<0.1	0.11
Tin	µg/g	50	300	50	50	300	1.18	1.13	0.49	0.46	0.49	0.43	0.62
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	1.23	0.726	0.666	0.508	0.585	0.521	0.839
Vanadium	µg/g	130	130	200	200	-	45.8	45.9	44.2	37.7	42.3	38.6	46.3
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	61.8	60.6	51.7	48.1	42.9	45.2	57.3
Laboratory Identification Number							7052560_7052560-69	7052560_7052560-74	7052560_7052560-70	7052560_7052560-65	7052560_7052560-66	7060116_7060116-17	7060116_7060116-18

NOTES:

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	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP28E2 SA#1	16TP28E2 SA#2	16TP28N1 SA#1	16TP28N1 SA#2	16TP28S1 SA#1	16TP28S1 SA#2	16TP28W1 SA#1
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP28E2 SA#1 D=0.15m	16TP28E2 SA#2 D=0.4m	16TP28N1 SA#1 D=0.15m	16TP28N1 SA#2 D=0.4m	16TP28S1 SA#1 D=0.15m	16TP28S1 SA#2 D=0.4m	16TP28W1 SA#1 D=0.15m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	7.4	7.5	**9.1**	7.8	**8.9**	**8.2**	**8.3**
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	<0.1	<0.1	0.12	<0.1	0.11	<0.1	0.75
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	1.59	1.74	2.27	1.42	2.6	1.52	5.71
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	62.3	75.6	38.1	62.1	34.6	59.6	98.7
Beryllium	µg/g	4	8	4	4	8	0.46	0.55	0.25	0.45	0.21	0.45	0.29
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.073	0.097	0.141	0.07	0.148	0.091	0.424
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	26.4	26.7	15.4	26.5	15.8	22.6	30.8
Cobalt	µg/g	50	300	50	50	300	11.4	10.7	4.83	8.99	4.93	9.39	8.72
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	15.6	15.4	15.4	12.7	14.9	13.8	45.7
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	2.58	3.09	3.64	2.36	2.72	2.52	12.9
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	8.4	8.89	9.08	8.58	8.16	8.41	13.9
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	468	489	240	416	228	431	402
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.67	0.61	0.49	0.6	0.38	0.62	1.18
Nickel	µg/g	45	89	100	100	500	22.3	21.9	12.3	17.7	13.8	19.2	24
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	34.5	35.9	32.1	34.1	34.4	34.5	86
Thallium	µg/g	1	1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.16
Tin	µg/g	50	300	50	50	300	0.58	0.59	0.43	0.59	0.28	0.57	1.6
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.626	0.735	0.456	0.666	0.523	0.641	0.604
Vanadium	µg/g	130	130	200	200	-	41.2	43.7	27	38	28.8	38.4	48.7
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	53.8	54.8	33.6	48.3	30.4	51.3	61.6
Laboratory Identification Number							7060116_7060116-13	7060116_7060116-14	7060116_7060116-01	7060116_7060116-02	7060116_7060116-05	7060116_7060116-06	7060116_7060116-09

NOTES:

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	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP28W1 SA#2	16TP30E1 SA#1	16TP30E1 SA#2	16TP30E2 SA#1	16TP30E2 SA#2	16TP30S1 SA#1	16TP30S1 S
							0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/201
							16TP28W1 SA#2 D=0.4m	16TP30E1 SA#1 D=0.15m	16TP30E1 SA#2 D=0.4m	16TP30E2 SA#1 D=0.15m	16TP30E2 SA#2 D=0.4m	16TP30S1 SA#1 D=0.15m	16TP30S1 SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	**9**	7.8	**8.4**	7.1	7.3	7.8	**8.4**
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.25	0.39	0.22	0.19	0.29	0.32	0.23
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	3.85	3.37	3.73	2.38	2.56	3.42	4.43
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	78.8	107	120	108	127	89.8	86.4
Beryllium	µg/g	4	8	4	4	8	0.27	0.48	0.52	0.53	0.57	0.36	0.27
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.399	0.197	0.19	0.165	0.16	0.239	0.379
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	33.6	26.8	31.5	29.8	32.6	24.7	32.1
Cobalt	µg/g	50	300	50	50	300	10.1	8.04	9.23	10.8	12.2	7.31	9.15
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	30.4	24	24	21.1	19.6	30.1	33.5
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	4.27	5.51	5.98	5.67	5.35	8.73	4.48
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	13	12.3	14.4	12.8	12.5	11.9	12.6
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	353	373	440	471	531	361	373
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	0.071	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	1.37	0.57	0.45	0.84	0.76	0.68	1.13
Nickel	µg/g	45	89	100	100	500	28.3	22.4	24.8	23.1	24.1	19.4	26.7
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	53.8	32.5	37.2	46.5	51.4	26.4	34.6
Thallium	µg/g	1	1	-	-	-	0.15	0.13	0.14	0.13	0.13	0.14	0.16
Tin	µg/g	50	300	50	50	300	0.48	0.49	0.51	0.71	0.7	0.93	0.49
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.689	0.68	0.708	0.951	0.964	0.694	0.552
Vanadium	µg/g	130	130	200	200	-	48.8	39.3	43.9	46.3	52.9	38.1	47.4
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	60.1	51.1	56.3	66	74.5	54.2	53.4
Laboratory Identification Number							7060116_7060116-10	7060116_7060116-37	7060116_7060116-38	7060116_7060116-33	7060116_7060116-34	7060116_7060116-21	7060116_7060116-22

NOTES:

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Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	SA#2	16TP30W1 SA#1	16TP30W1 SA#2	16TP30W2 SA#1	16TP30W2 SA#2	16TP34E1 SA#1	16TP34E1 SA#2
								0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							7	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							Dupe #5	16TP30W1 SA#1 D=0.15m	16TP30W1 SA#2 D=0.4m	16TP30W2 SA#1 D=0.15m	16TP30W2 SA#2 D=0.4m	16TP34E1 SA#1 D=0.15m	16TP34E1 SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	**8.3**	7.9	7.8	7.5	**8.5**	7.6	7.9
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.28	0.47	0.32	0.19	0.11	0.48	0.24
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	4.28	3.96	3.92	2.64	2.12	3.7	2.72
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	100	82.3	117	84.9	97.2	93.5	113
Beryllium	µg/g	4	8	4	4	8	0.25	0.32	0.48	0.39	0.47	0.32	0.52
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	3	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.335	0.36	0.337	0.2	0.136	0.336	0.201
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	29.6	32.1	35.9	24.4	29.9	23.7	26.7
Cobalt	µg/g	50	300	50	50	300	8.74	8.79	10.8	7.36	12.9	7.45	8.84
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	28.7	**93.5**	41.1	28.6	17.8	**169**	27.8
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	4.94	15.5	8.46	6.83	3.89	19	6.81
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	11.7	11.9	14.6	10.9	9.3	9.85	13.1
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	342	370	464	365	583	395	427
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.89	1.65	0.97	0.63	0.95	1.75	0.52
Nickel	µg/g	45	89	100	100	500	25.2	26.1	32	19.3	24	19.8	22.5
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	53.1	50.3	32.1	30.2	58.8	34.3	33.1
Thallium	µg/g	1	1	-	-	-	0.18	0.14	0.18	0.12	0.1	0.11	0.14
Tin	µg/g	50	300	50	50	300	0.53	1.1	0.77	0.52	0.73	1.11	0.53
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.572	0.744	0.976	0.699	0.71	0.808	0.862
Vanadium	µg/g	130	130	200	200	-	46.7	43.6	47.8	34.5	56.4	35.7	36.9
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	52	59.9	63.4	47	63.5	59	55.6
Laboratory Identification Number							7060116_7060116-AJ	7060116_7060116-29	7060116_7060116-30	7060116_7060116-25	7060116_7060116-26	7060116_7060116-53	7060116_7060116-54

NOTES:

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CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP34E2 SA#1	16TP34E2 SA#2	16TP34N1 SA#1	16TP34N1 SA#2	16TP34S1 SA#1	16TP34S1 SA#2	16TP34W1 SA#1
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP34E2 SA#1 D=0.15m	16TP34E2 SA#2 D=0.4m	16TP34N1 SA#1 D=0.15m	16TP34N1 SA#2 D=0.4m	16TP34S1 SA#1 D=0.15m	16TP34S1 SA#2 D=0.4m	16TP34W1 SA#1 D=0.15m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	8	7.2	**8.3**	**8.5**	**8.2**	**8.5**	**8.1**
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.13	0.1	0.69	0.34	0.67	0.23	0.36
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	1.88	2.01	4.48	4.18	4.01	3.35	4.96
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	92.4	68.8	75.5	123	87.6	107	108
Beryllium	µg/g	4	8	4	4	8	0.43	0.4	0.24	0.36	0.49	0.36	0.36
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.17	0.133	0.385	0.359	0.399	0.343	0.381
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	18.4	21.5	35.1	41.1	36.7	41.4	31.7
Cobalt	µg/g	50	300	50	50	300	5.96	6.59	8.95	10.8	9.15	10.7	9.23
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	15.5	14.9	**106**	33.8	**94.4**	33.1	33.1
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	5.13	4.7	22.8	5.51	16.8	5.27	6.27
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	9.47	10.1	13	15.8	12.4	13.4	14.3
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	381	344	362	399	369	367	416
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.38	0.37	1.81	0.84	2.9	0.85	1.18
Nickel	µg/g	45	89	100	100	500	13	15.5	26.9	30.1	29.6	36	24.2
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	0.72	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	29.8	22.3	30.3	41.8	30.7	35.9	33.2
Thallium	µg/g	1	1	-	-	-	<0.1	<0.1	0.15	0.2	0.17	0.18	0.18
Tin	µg/g	50	300	50	50	300	0.42	0.38	3.83	0.49	2.02	0.49	0.53
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.848	0.86	1.32	0.631	0.878	0.667	0.885
Vanadium	µg/g	130	130	200	200	-	29.1	31.2	47.9	52.5	49.2	49.6	52.9
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	47.3	42.2	58.7	61	63.2	60.5	63
Laboratory Identification Number							7060116_7060116-49	7060116_7060116-50	7060116_7060116-41	7060116_7060116-42	7060116_7060116-45	7060116_7060116-46	7060116_7060116-61

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP34W1 SA#2	16TP34W2 SA#1	16TP34W2 SA#2	16TP37E1 SA#1	16TP37E1 SA#2	16TP37E2 SA#1	16TP37E2 SA#2
							0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP34W1 SA#2 D=0.4m	16TP34W2 SA#1 D=0.15m	16TP34W2 SA#2 D=0.4m	16TP37E1 SA#1 D=0.15m	16TP37E1 SA#2 D=0.4m	16TP37E2 SA#1 D=0.15m	16TP37E2 SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	**8.1**	7.4	**8.1**	**8.4**	**8.2**	7.4	7.5
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.36	0.22	0.17	0.36	0.42	0.13	0.15
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	5.13	2.65	3.14	4.41	4.28	2.84	3.31
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	109	107	112	81.7	137	89.5	110
Beryllium	µg/g	4	8	4	4	8	0.32	0.5	0.53	0.26	0.45	0.43	0.48
Boron_	µg/g	-	-	-	-	-	<2	2.6	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.399	0.173	0.159	0.421	0.448	0.167	0.197
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	37.3	27.2	28.6	31.5	38.7	20.9	27.4
Cobalt	µg/g	50	300	50	50	300	9.92	9.08	9.21	8.76	12.6	7.39	9.21
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	37.3	35.9	24.4	**89.9**	43.4	22.2	24
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	5.97	9.7	6.71	10.3	10.9	5.21	5.9
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	14.8	14.3	15	12.2	16	9.57	12.8
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	428	431	419	361	510	359	404
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.9	0.61	0.39	1.47	1.01	0.47	0.44
Nickel	µg/g	45	89	100	100	500	27	23.4	24.9	26.3	32.8	17.5	23.6
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	0.24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	38.1	39.9	36.2	50.5	42.3	28	31.9
Thallium	µg/g	1	1	-	-	-	0.19	0.15	0.15	0.14	0.2	0.12	0.15
Tin	µg/g	50	300	50	50	300	0.54	0.74	0.54	0.91	1.06	0.43	0.48
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.615	0.918	0.877	0.974	0.971	0.896	1.07
Vanadium	µg/g	130	130	200	200	-	57.5	38.1	39	48.2	58.3	33.2	40.6
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	65.6	56.7	54.4	60.6	74.4	45	54.5
Laboratory Identification Number							7060116_7060116-62	7060116_7060116-57	7060116_7060116-58	7060116_7060116-85	7060116_7060116-86	7060116_7060116-81	7060116_7060116-82

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
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PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP37N1 SA#1	16TP37N1 SA#2		16TP37S1 SA#1	16TP37S1 SA#2	16TP37W1 SA#1	16TP37W1 SA#2
							0.15 m	0.4 m		0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017		5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP37N1 SA#1 D=0.15m	16TP37N1 SA#2 D=0.4m	Dupe #6	16TP37S1 SA#1 D=0.15m	16TP37S1 SA#2 D=0.4m	16TP37W1 SA#1 D=0.15m	16TP37W1 SA#2 D=0.4m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	**8.5**	**8.9**	**8.9**	**8.4**	**8.6**	**8.3**	8
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.63	0.16	0.15	0.57	0.29	0.43	0.6
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	4.82	3.38	3.66	4.9	4.66	4.62	5.28
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	151	78.5	69.2	104	103	87.2	103
Beryllium	µg/g	4	8	4	4	8	0.41	0.3	0.26	0.33	0.33	0.32	0.38
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.497	0.433	0.475	0.416	0.353	0.432	0.466
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	48.1	33.6	34.6	32.4	36.2	34.7	34.3
Cobalt	µg/g	50	300	50	50	300	12.6	9.19	9.27	9.75	10.7	9.66	10.5
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	**105**	30.9	30.8	47.2	44.4	**90.4**	**117**
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	15.3	4.04	4.25	11.7	5.77	12.7	17.5
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	16	12.7	13.6	13.9	14.6	13.1	13.6
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	454	342	377	433	401	378	441
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	1.63	1.28	1.23	1.26	1.04	1.45	1.61
Nickel	µg/g	45	89	100	100	500	39.4	28.3	30.9	26.5	31.2	29.3	28.8
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Silver	mg/kg	20	40	20	20	40	0.23	<0.2	<0.2	<0.2	<0.2	<0.2	0.21
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	58.3	64.9	44.1	38.5	38.9	43.8	38.8
Thallium	µg/g	1	1	-	-	-	0.23	0.16	0.15	0.18	0.19	0.17	0.17
Tin	µg/g	50	300	50	50	300	3.22	0.35	0.36	1.3	0.6	1.1	2.14
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.875	0.764	0.778	0.657	0.633	0.651	0.871
Vanadium	µg/g	130	130	200	200	-	60.9	49.3	50.7	49.3	57	50.3	47.8
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	78.2	58.4	62.2	66.3	63.1	67.3	73.8
Laboratory Identification Number							7060116_7060116-65	7060116_7060116-66	7060116_7060116-AK	7060116_7060116-69	7060116_7060116-70	7060116_7060116-77	7060116_7060116-78

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
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CL	Commercial Land Standards
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	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP37W2 SA#1	16TP37W2 SA#2	16TP39E1 SA#1	16TP39E1 SA#2	16TP39E2 SA#1	16TP39E2 SA#2	16TP39N1 SA#1
							0.15 m	0.4 m	0.15 m	0.4 m	0.15 m	0.4 m	0.15 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP37W2 SA#1 D=0.15m	16TP37W2 SA#2 D=0.4m	16TP39E1 SA#1 D=0.15m	16TP39E1 SA#2 D=0.4m	16TP39E2 SA#1 D=0.15m	16TP39E2 SA#2 D=0.4m	16TP39N1 SA#1 D=0.15m
Physical Parameters				-	-	-							
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	6.9	7.3	7.7	**8.1**	7.3	7.3	**8.1**
Metals				-	-	-							
Antimony	µg/g	20	40	20	20	40	0.25	0.18	0.41	0.18	0.14	0.14	0.82
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	3.72	3.44	4.56	3.18	2.08	2.3	4.91
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	106	77.7	133	126	142	71.3	82.4
Beryllium	µg/g	4	8	4	4	8	0.61	0.42	0.51	0.49	0.4	0.38	0.26
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	2.1	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.167	0.154	0.389	0.223	0.265	0.129	0.468
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	30.7	29.3	33.1	26.1	16.6	21.9	31.2
Cobalt	µg/g	50	300	50	50	300	9.94	8.89	11.2	8.52	6.24	6.82	8.69
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	37.3	23.4	**76.4**	23.4	36.6	17.4	**108**
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	8.32	5.47	12.5	6.41	7.24	4.34	21.4
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	13.6	13	14.1	12.7	9.35	8.44	11.5
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	418	355	507	444	437	335	411
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	0.59	0.45	1.18	0.45	0.56	0.37	1.98
Nickel	µg/g	45	89	100	100	500	25.7	26.9	27.5	22	12.9	16.4	25.1
Selenium	µg/g	1	2.9	3	3	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	30.8	26.9	39.3	40.8	35.7	25.5	54
Thallium	µg/g	1	1	-	-	-	0.16	0.14	0.19	0.15	0.1	0.11	0.15
Tin	µg/g	50	300	50	50	300	0.67	0.42	1.06	0.56	0.51	0.4	2.46
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	1.55	0.619	1.03	1.11	1.05	3.83	0.574
Vanadium	µg/g	130	130	200	200	-	41.6	40.2	47.6	38.5	26.9	30	46.6
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	50.4	48	67.2	58.6	60.6	40.4	62
Laboratory Identification Number							7060116_7060116-73	7060116_7060116-74	7060116_7060116-AF	7060116_7060116-AG	7060116_7060116-AB	7060116_7060116-AC	7060116_7060116-89

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
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CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
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	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 2: Soil Analytical Results - Metals

Parameter	Unit	CCME - Residential/ Parkland	CCME - Commercial	CSR - PL	CSR - RL	CSR - CL	16TP39N1 SA#2	16TP39W1 SA#1	16TP39W1 SA#2	16TP39W2 SA#1	16TP39W2 SA#2
							0.4 m	0.15 m	0.4 m	0.15 m	0.4 m
							5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
							16TP39N1 SA#2 D=0.4m	16TP39W1 SA#1 D=0.15m	16TP39W1 SA#2 D=0.4m	16TP39W2 SA#1 D=0.15m	16TP39W2 SA#2 D=0.4m
Physical Parameters				-	-	-					
pH (1:2 H2O Solution)	pH Units	6-8	6-8	-	-	-	**8.6**	7.8	7.9	7.4	7.8
Metals				-	-	-					
Antimony	µg/g	20	40	20	20	40	0.22	0.68	1.01	0.21	0.2
Arsenic	µg/g	12	12	15 #1	15 #1	15 #1	4.25	5.68	4.56	4.08	3.7
Barium	µg/g	500	2000	400 #1	400 #1	400 #1	91.5	98	106	116	108
Beryllium	µg/g	4	8	4	4	8	0.29	0.32	0.37	0.5	0.46
Boron_	µg/g	-	-	-	-	-	<2	<2	<2	<2	<2
Cadmium	µg/g	10	22	3 #1,2	3 #1,2	25 #1,2	0.402	0.537	0.319	0.219	0.215
Chromium	µg/g	64	87	60 #1	60 #1	60 #1	39.4	36.1	26.7	32.3	30.1
Cobalt	µg/g	50	300	50	50	300	10.9	10.5	9.16	10.1	9.26
Copper	µg/g	63	91	150 #1,2	150 #1,2	250 #1,2	35.5	**164**	56.8	34.3	27
Lead	µg/g	140	260	400 #1,2	400 #1,2	700 #1,2	4.55	20.8	9.39	7.84	6.24
Lithium	µg/g	-	-	1600 #3	1600 #3	20,000 #3	13	12.8	12.1	14.1	13.7
Manganese	µg/g	-	-	1800 #3	1800 #3	19,000 #3	366	402	377	430	428
Mercury	mg/kg	6.6	24	15 #1	15 #1	40 #1	<0.04	<0.04	<0.04	<0.04	<0.04
Molybdenum	µg/g	10	40	10	10	40	1.18	1.96	1.85	0.6	0.63
Nickel	µg/g	45	89	100	100	500	33.2	31.7	26.3	28.4	25.7
Selenium	µg/g	1	2.9	3	3	10	<0.5	0.53	<0.5	<0.5	<0.5
Silver	mg/kg	20	40	20	20	40	<0.2	0.24	0.2	<0.2	<0.2
Strontium	µg/g	-	-	47,000 #3	47,000 #3	100,000 #3	67.2	43.5	31.3	33.7	32.4
Thallium	µg/g	1	1	-	-	-	0.18	0.18	0.15	0.16	0.16
Tin	µg/g	50	300	50	50	300	0.45	1.9	0.81	0.57	0.47
Uranium	µg/g	23	33	16 #3	16 #3	200 #3	0.781	0.818	0.742	0.697	0.684
Vanadium	µg/g	130	130	200	200	-	50.1	49.5	42.8	43.5	43.4
Zinc	µg/g	200	360	450 #1,2	450 #1,2	600 #1,2	60.1	70.4	58	59.3	56.9
Laboratory Identification Number							7060116_7060116-90	7060116_7060116-97	7060116_7060116-98	7060116_7060116-93	7060116_7060116-94

NOTES:

#1	CSR Schedule 5 Substance.
#2	Standard is pH dependent. Values shown based on median pH of 7.9
#3	CSR Schedule 10 Substance.
-	Not analyzed or no guideline/standard exists.
<	Concentration is less than the laboratory detection limit indicated.
CCME	Canadian Council of Ministers of the Environment (CCME) (Updated 2015). Soil Quality Guidelines for the Protection of Environmental and Human Health, for coarse soils under Residential/Parkland and Commercial land use
CSR	BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 184/2016, July 19, 2016 - Schedules 4, 5 and 10).
PL	Park Land Standards
RL	Residential Land Standards
CL	Commercial Land Standards
Site specific factors include:	- Intake of contaminated soil.
	- Toxicity to soil invertebrates and plants.
	- Groundwater used for drinking water.
	- Groundwater flow to surface water used by freshwater aquatic life.
	Most stringent applicable site specific standard is shown.
Bold	Bold and shaded indicates an exceedance of the CCME guideline or CSR standard

Table 4: Soil Quality Assurance/Quality Control Analytical Results

Parameter	Units	EQL	16TP02W1 SA#1 0.15 m 5/29/2017	DUP #1 5/29/2017	RPD %	16TP14N1 SA#2 0.4 m 5/29/2017	DUP #2 5/29/2017	RPD %	16TP14W1SA#1 0.15 m 5/30/2017	DUP #3 5/30/2017	RPD %	16TP22W1SA#1 0.15 m 5/30/2017	DUP #4 5/30/2017	RPD %	16TP30S1 SA#2 0.4 m 5/31/2017	Dupe #5 5/31/2017	RPD %	16TP37N1 SA#2 0.4 m 5/31/2017	Dupe #6 5/31/2017	RPD %
Physical Parameters																				
pH	pH Units	0.1	8	7.9	1	7.7	8	4	7.9	7.8	1	8.2	8.3	1	8.4	8.3	1	8.9	8.9	0
Percentage Solids	%	0.1	96.9	96.2	1	89.9	94	4	97	98.5	2	98.6	97.8	1	95.9	94.4	2	97.1	96.9	0
Metals																				
Antimony	µg/g	0.1	0.66	0.63	5	<0.1	<0.1	-	0.32	0.44	-	0.45	0.41	-	0.23	0.28	-	0.16	0.15	-
Arsenic	µg/g	0.4	3.97	4.08	3	1.34	1.67	-	3.22	3.5	8	4.19	3.9	7	4.43	4.28	3	3.38	3.66	8
Barium	µg/g	1	102	94.1	8	75.1	72.8	3	71.8	91.5	24	85.7	79.9	7	86.4	100	15	78.5	69.2	13
Beryllium	µg/g	0.1	0.37	0.34	-	0.4	0.37	-	0.23	0.23	-	0.21	0.21	-	0.27	0.25	-	0.3	0.26	-
Boron_	µg/g	2	2.3	<2	-	<2	<2	-	<2	<2	0	<2	<2	-	<2	<2	-	<2	<2	-
Cadmium	µg/g	0.04	0.424	0.408	4	0.162	0.158	-	0.354	0.41	15	0.467	0.428	9	0.379	0.335	12	0.433	0.475	9
Chromium	µg/g	1	41	36.5	12	22.9	23.2	1	32.6	32.8	1	32.2	33.8	5	32.1	29.6	8	33.6	34.6	3
Cobalt	µg/g	0.1	12.4	11.6	7	9.72	9.13	6	8.71	9.73	11	9.71	8.96	8	9.15	8.74	5	9.19	9.27	1
Copper	µg/g	0.2	96.8	86.5	11	14.7	15.3	4	87.8	120	31	96.1	84.5	13	33.5	28.7	15	30.9	30.8	0
Lead	µg/g	0.2	15.8	14.1	11	3.16	3.29	4	11.9	14.9	22	13.1	12	9	4.48	4.94	10	4.04	4.25	5
Lithium	µg/g	0.1	14.3	13.3	7	7.63	7.55	1	10.1	8.98	12	10.3	9.89	4	12.6	11.7	7	12.7	13.6	7
Manganese	µg/g	0.4	521	483	8	549	449	20	360	384	6	386	378	2	373	342	9	342	377	10
Mercury	mg/kg	0.04	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-
Molybdenum	µg/g	0.1	1.49	1.46	2	0.92	0.82	11	1.51	1.79	17	1.45	1.33	9	1.13	0.89	24	1.28	1.23	4
Nickel	µg/g	0.4	32.6	30.8	6	17.1	16.5	4	23.8	27.8	16	28.6	26.1	9	26.7	25.2	6	28.3	30.9	9
Selenium	µg/g	0.5	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	0.51	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-
Silver	mg/kg	0.2	<0.2	<0.2	-	<0.2	<0.2	-	0.22	0.21	-	0.23	0.21	-	<0.2	<0.2	-	<0.2	<0.2	-
Strontium	µg/g	0.2	39.6	40.5	2	45.5	45.3	0	28.9	29.2	1	32.6	30.9	5	34.6	53.1	42	64.9	44.1	38
Thallium	µg/g	0.1	0.16	0.14	-	<0.1	<0.1	-	0.13	0.15	-	0.18	0.16	-	0.16	0.18	-	0.16	0.15	-
Tin	µg/g	0.2	1.45	1.31	10	0.5	0.49	-	0.91	1.24	-	1.18	1.13	4	0.49	0.53	-	0.35	0.36	-
Uranium	µg/g	0.05	0.828	0.673	21	0.913	0.856	6	0.758	0.887	16	1.23	0.726	52	0.552	0.572	4	0.764	0.778	2
Vanadium	µg/g	1	57.5	51.8	10	43.1	43.9	2	47.2	45.7	3	45.8	45.9	0	47.4	46.7	1	49.3	50.7	3
Zinc	µg/g	2	75.6	75.6	0	80.1	67.3	17	59.5	66	10	61.8	60.6	2	53.4	52	3	58.4	62.2	6
Hydrocarbons																				
F2 (C10-C16)	µg/g	100	<100	<100	-	<100	<100	-	<100	<100	-	-	-	-	<100	<100	-	<100	<100	-
F2-NAPHTHALENE	µg/g	100	<100	<100	-	<100	<100	-	<100	<100	-	-	-	-	<100	<100	-	<100	<100	-
F3 (C16-C34)	µg/g	200	<200	<200	-	<200	<200	-	<200	<200	-	-	-	-	<200	<200	-	<200	<200	-
F3-PAH	µg/g	200	<200	<200	-	<200	<200	-	<200	<200	-	-	-	-	<200	<200	-	<200	<200	-
F4 (C34-C50)	µg/g	200	<200	<200	-	<200	<200	-	<200	<200	-	-	-	-	<200	<200	-	<200	<200	-
Polycyclic Aromatic Hydrocarbons (PAHs)																				
B(a)P Total Potency Equivalent	µg/g	0.01	0.0986	0.135	31	<0.01	<0.01	-	0.154	0.181	16				0.0314	<0.01	-	<0.01	<0.01	-
IACR (CCME)	µg/g	0.0625	1.86	2.16	15	<0.0625	<0.0625	-	2.44	3.26	29				0.139	<0.0625	-	<0.0625	<0.0625	-
2-methylnaphthalene	µg/g	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	0.01	-	<0.01	<0.01	-
Acenaphthene	µg/g	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	0.007	-	<0.005	<0.005	-
Acenaphthylene	µg/g	0.005	0.013	0.014	-	<0.005	<0.005	-	0.027	0.028	4	0.021	0.024	-	<0.005	<0.005	-	<0.005	<0.005	-
Anthracene	µg/g	0.004	0.039	0.04	3	<0.004	<0.004	-	0.079	0.072	9	0.075	0.085	13	0.005	0.004	-	<0.004	<0.004	-
Benz(a)anthracene	µg/g	0.01	0.033	0.036	-	<0.01	<0.01	-	0.024	0.026	-	0.072	0.08	11	<0.01	<0.01	-	<0.01	<0.01	-
Benzo(a)pyrene	µg/g	0.01	0.052	0.079	41	<0.01	<0.01	-	0.069	0.087	23	0.094	0.101	7	<0.01	<0.01	-	<0.01	<0.01	-
Benzo(b)fluoranthene	µg/g	0.01	0.131	0.146	11	<0.01	<0.01	-	0.214	0.237	10	0.22	0.215	2	<0.01	<0.01	-	<0.01	<0.01	-
Benzo(g,h,i)perylene	µg/g	0.02	0.129	0.151	16	<0.02	<0.02	-	0.504	0.427	17	0.263	0.295	11	0.038	<0.02	-	<0.02	<0.02	-
Benzo(k)fluoranthene	µg/g	0.01	0.053	0.063	17	<0.01	<0.01	-	0.086	0.094	9	0.094	0.092	2	<0.01	<0.01	-	<0.01	<0.01	-
Chrysene	µg/g	0.01	0.071	0.065	9	<0.01	<0.01	-	0.084	0.077	9	0.129	0.123	5	<0.01	<0.01	-	<0.01	<0.01	-
Dibenz(a,h)anthracene	µg/g	0.005	0.012	0.015	-	<0.005	<0.005	-	0.028	0.026	7	0.02	0.019	-	0.028	<0.005	-	<0.005	<0.005	-
Fluoranthene	µg/g	0.01	0.064	0.049	-	<0.01	<0.01	-	0.105	0.084	22	0.14	0.101	32	<0.01	<0.01	-	<0.01	<0.01	-
Fluorene	µg/g	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Indeno(1,2,3-c,d)pyrene	µg/g	0.02	0.062	0.083	-	<0.02	<0.02	-	0.186	0.171	8	0.118	0.117	1	0.028	<0.02	-	<0.02	<0.02	-
Naphthalene	µg/g	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Phenanthrene	µg/g	0.02	<0.02	<0.02	-	<0.02	<0.02	-	0.027	0.02	-	0.026	0.022	-	<0.02	<0.02	-	<0.02	<0.02	-
Pyrene	µg/g	0.02	0.067	0.055	-	<0.02	<0.02	-	0.099	0.085	-	0.149	0.149	0	<0.02	<0.02	-	<0.02	<0.02	-
Laboratory Sample ID			7052353	7052353		7052353	7052353		7052560	7052560		7052560	7052560		7060116	7060116		7060116	7060116	

NOTES:

-	Not analyzed or RPD not calculated.
<	Concentration is less than the laboratory detection limit indicated.
RDL	Laboratory Reportable Detection Limit
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is greater than 5 times the RDL
BOLD	High RPDs are in bold (acceptable RPD is 45% for metals in soil [60% for high variability metals] 75% for PAHs in soil, and 60% for EPH and other organics in soil as recommended by BC Ministry of Environment Q&A, and BC Environmental Laboratory Manual).
	High variability metals include: Ag, Al, Ba, Hg, K, Mo, Na, Pb, Sn, Sr, and Ti

Table 3: Leachable Copper in Soil

Parameter	Unit	CDWG	FIGQG AW	16TP14E1 SA#1	16TP34E1 SA#1	16TP39N1 SA#1
				0.15 m	0.15 m	0.15 m
				5/29/2017	5/29/2017	5/29/2017
Leachate Metals						
Copper	µg/L	1000	2	<0.10	<0.10	<0.10
Laboratory Identification Number				7052560-13	7060116-53	7060116-89

NOTES:

Leachable copper concentration measured by synthetic precipitation leaching procedure

<	Concentration is less than the laboratory detection limit indicated.
CDWG	Canadian Drinking Water Guideline is an aesthetic objective only
FIGQG	Federal Interim Groundwater Quality Guidelines (June 16, Verision 4) for protection of aquatic life for residential, commercial, and industrial land uses.

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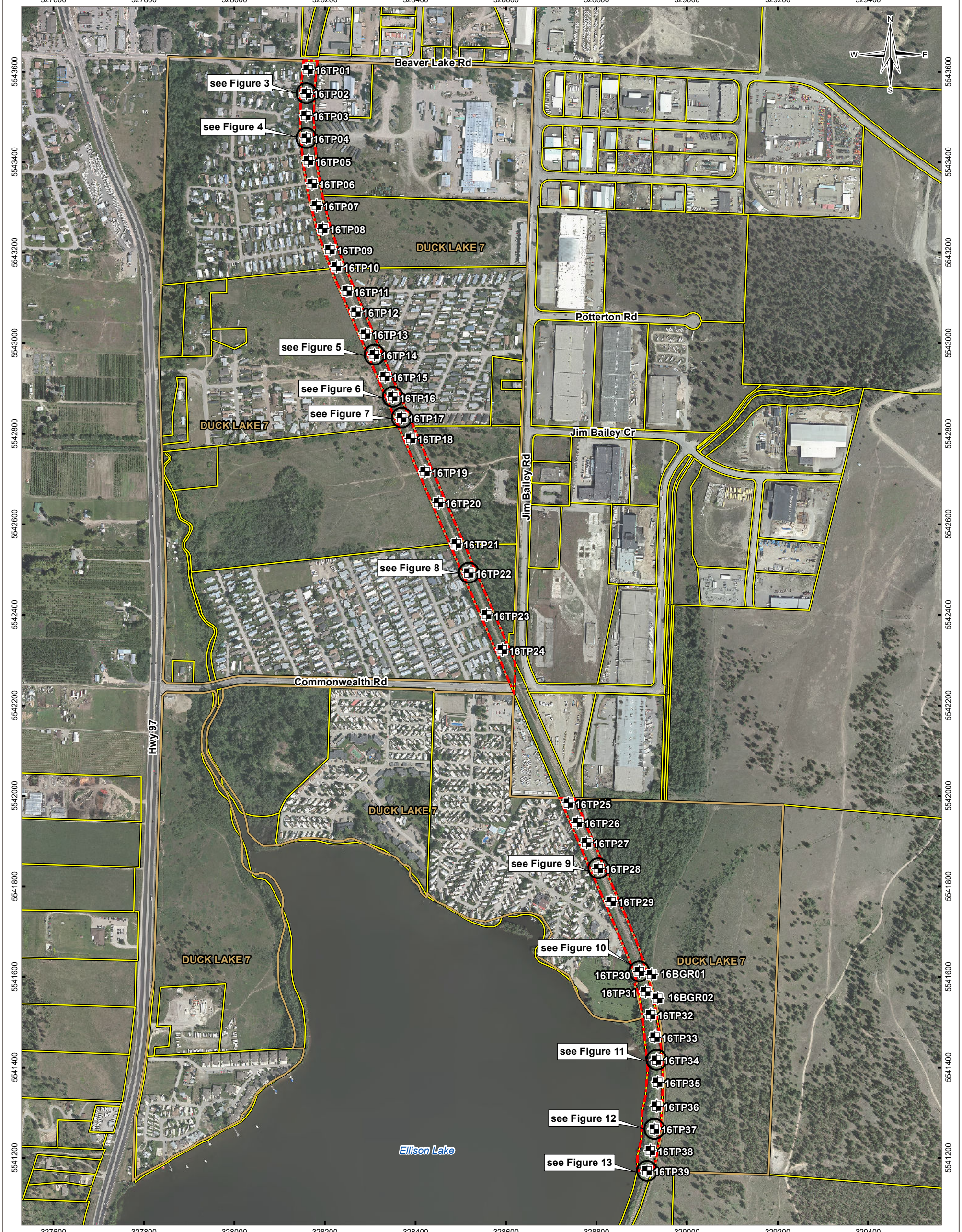


LEGEND

- Testpit
- CN Rail Study Area
- Parcel Boundary
- IR Boundary

NOTES
Base data source:
Indian Reserve Administrative Boundaries provided by DataBC.
Parcel boundaries and 2015 imagery provided by the City of Kelowna.

STATUS
ISSUED FOR USE

PHASE III ESA - CN RAIL ROW MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5 DUCK LAKE IR 7

Testpit Plan

PROJECTION	DATUM	CLIENT
UTM Zone 11	NAD83	Okanagan Indian Band and Indigenous and Northern Affairs Canada

Scale: 1:8,000
100 50 0 100
Metres

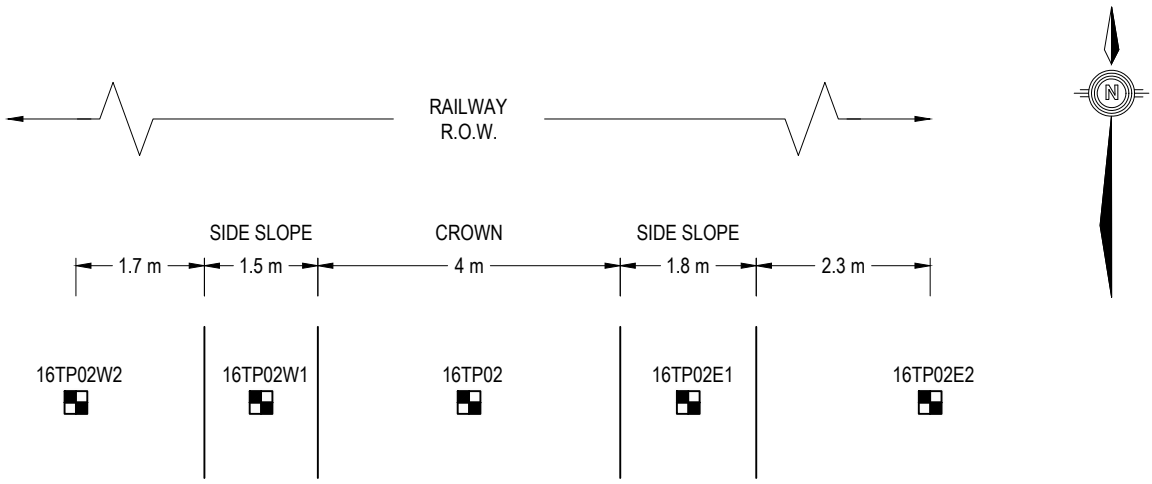
FILE NO.
VENW03093-01_Figure02_TestpitPlan.mxd

OFFICE	DWN	CKD	APVD	REV
Tt-VANC	SL	MEZ	CC	0

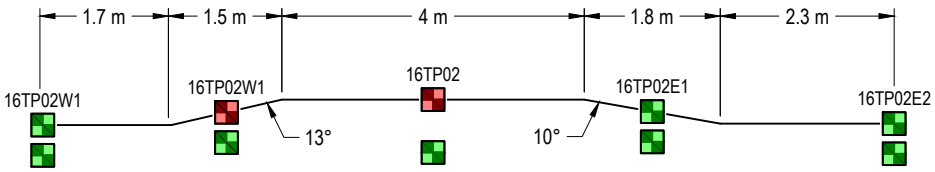
DATE	PROJECT NO.
December 20, 2017	ENW.VENW03093-01

TETRA TECH

Figure 2



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND
- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

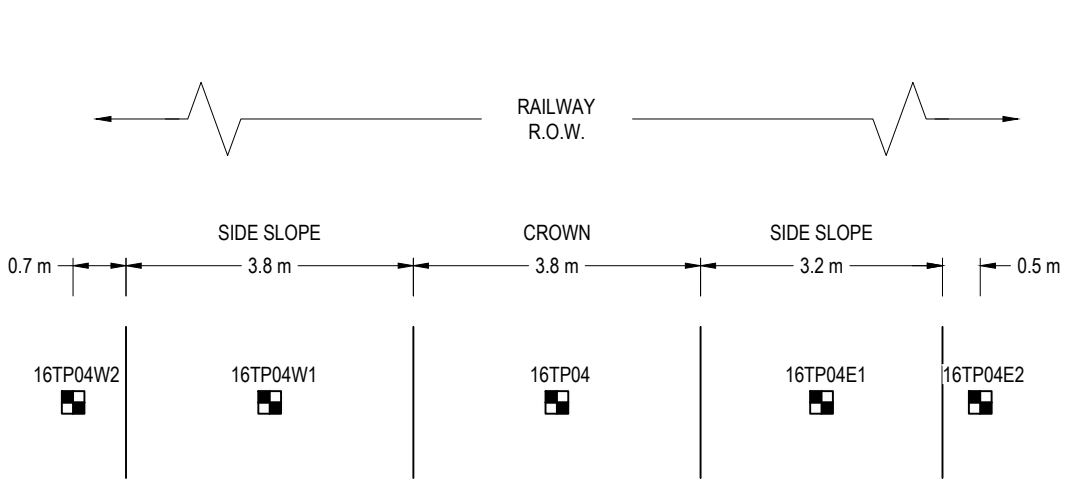
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL
16TP02

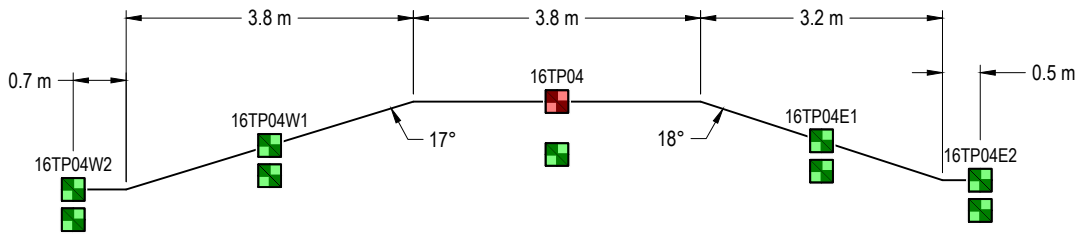
PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 3



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

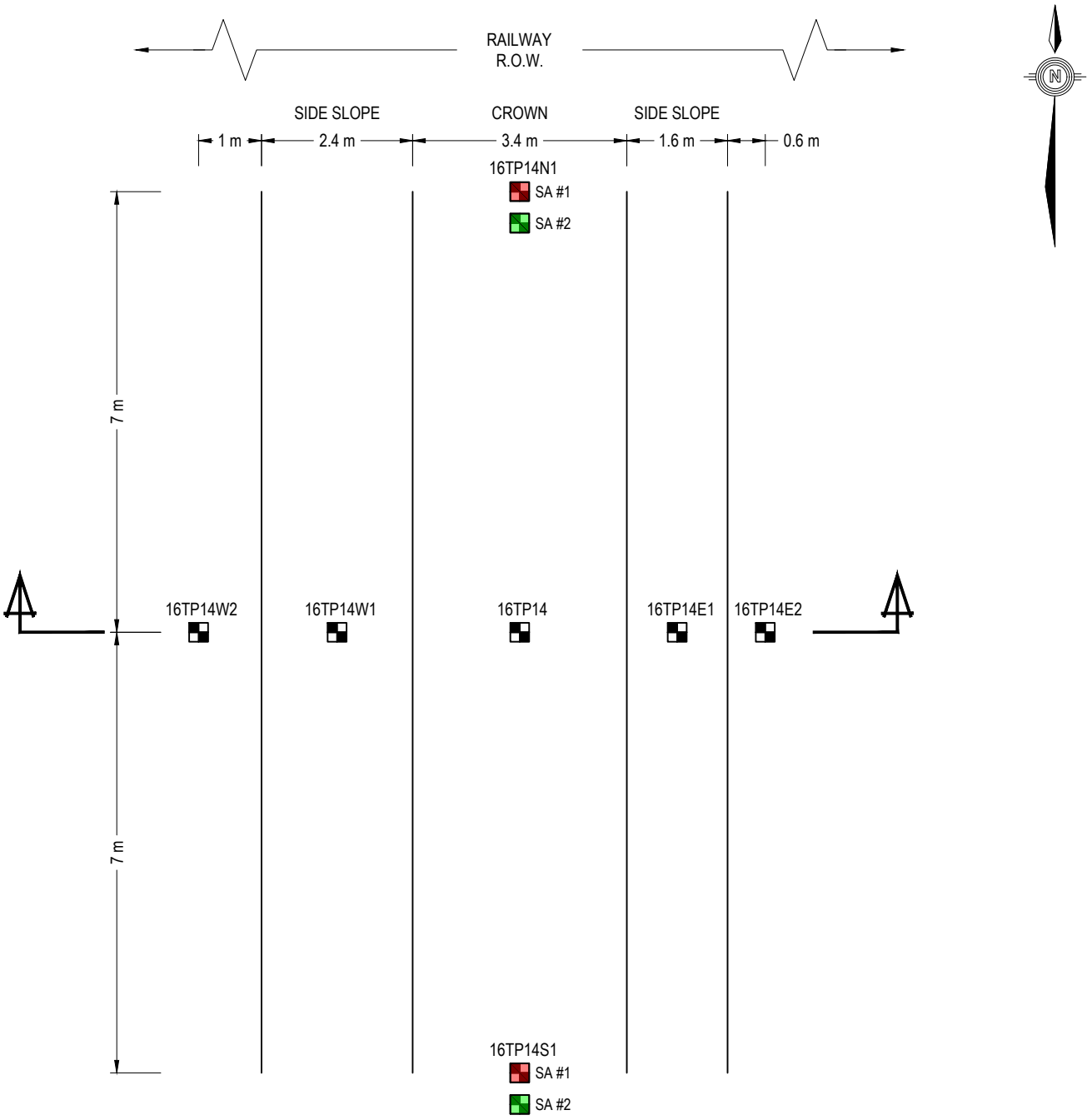
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL
16TP04

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 4



ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

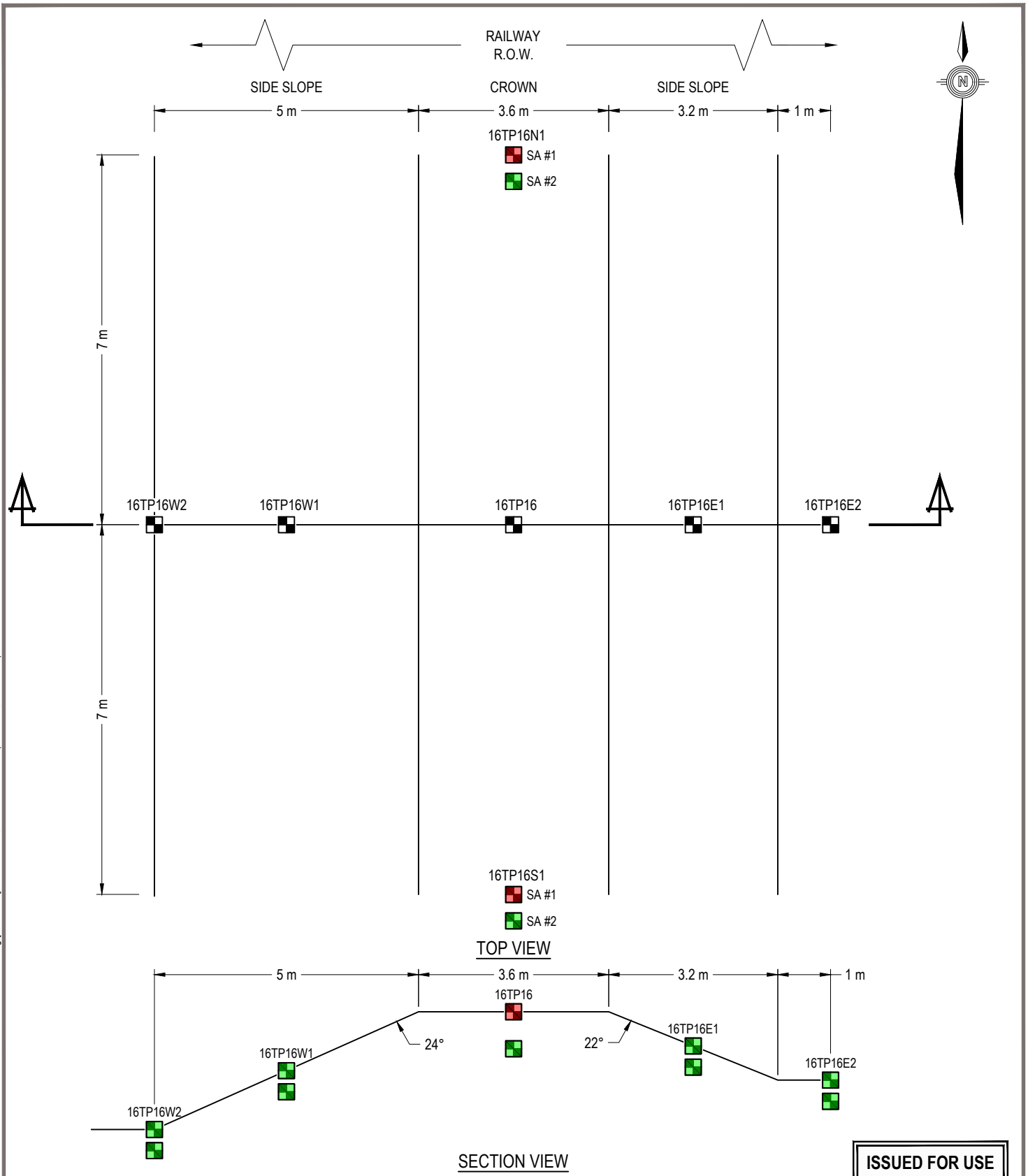
PAH CONCENTRATIONS IN SOIL 16TP14

TETRA TECH

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 5



ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

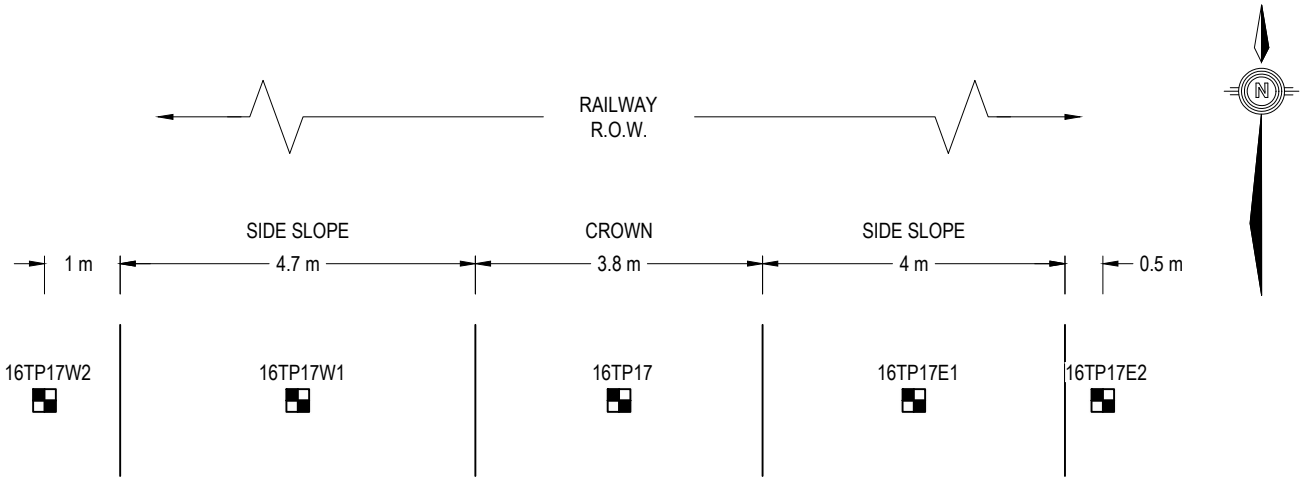
PAH CONCENTRATIONS IN SOIL 16TP16

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

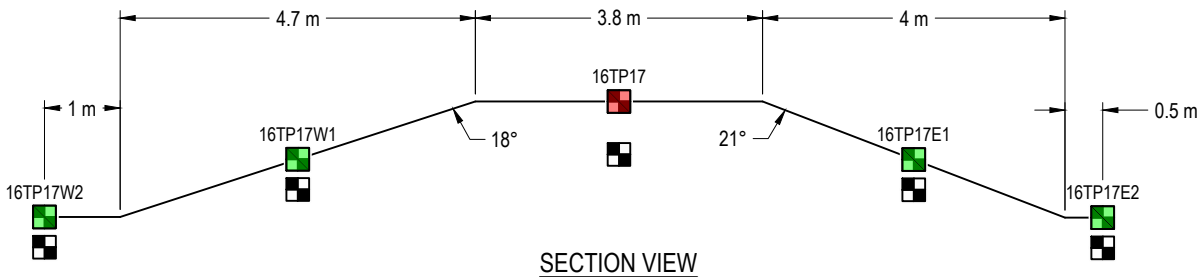
OFFICE	DATE
VANC	December 20, 2017

Figure 6

Q:\Vancouver\Drafting\Environmental\VEN\ENW.VENW03093-01\ENW.VENW03093-01 PAH Sections R0a.dwg [FIGURE 6] December 20, 2017 - 9:59:47 am (BY: HALL, ROBERT J)



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

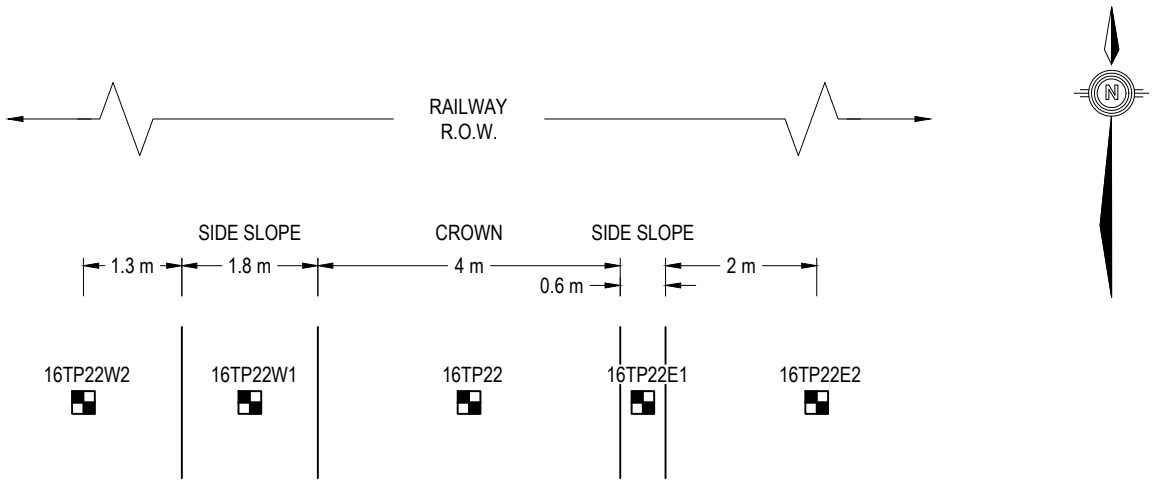
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL
16TP17

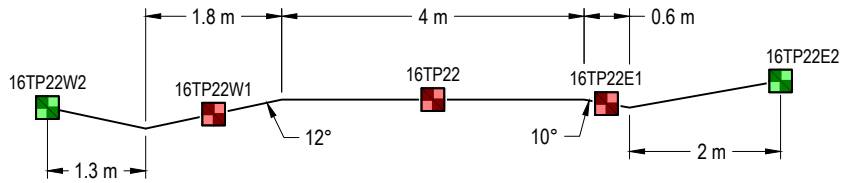
PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 7



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND
- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

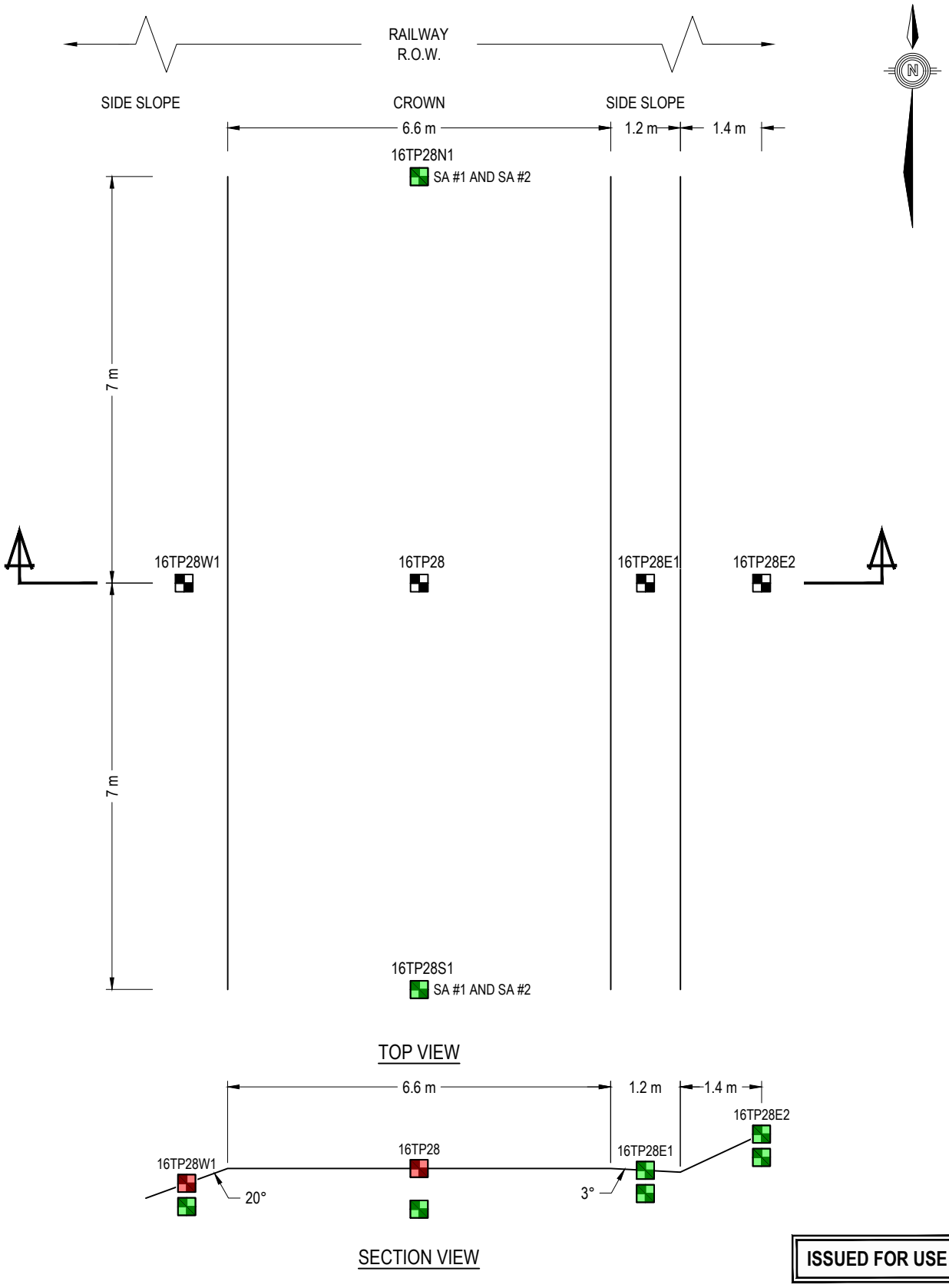
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL
16TP22

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 8



ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

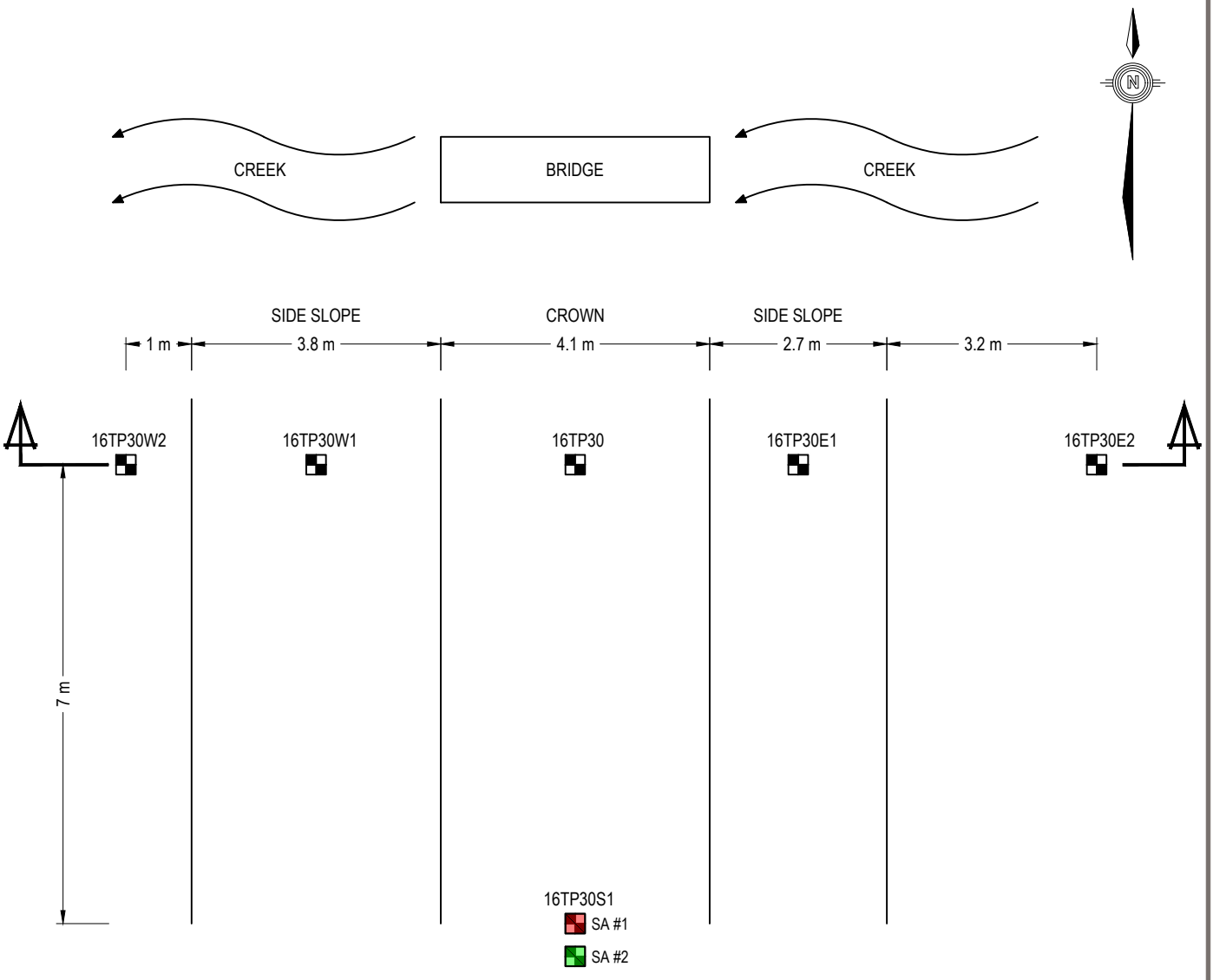
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL
16TP28

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 9



ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

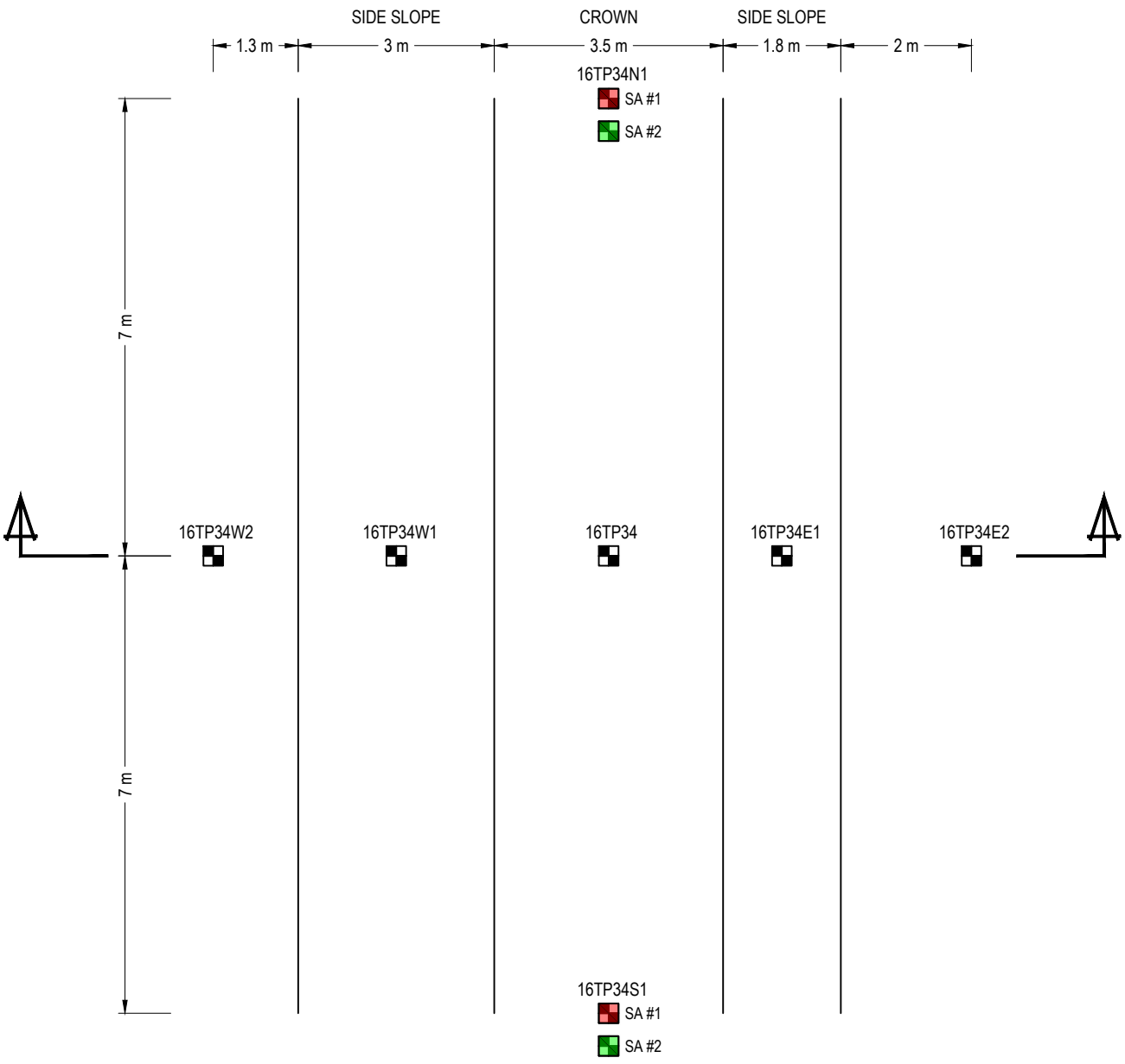
PAH CONCENTRATIONS IN SOIL 16TP30

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

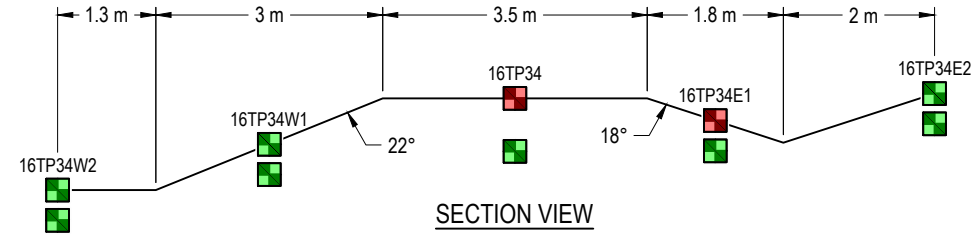
OFFICE	DATE
VANC	December 20, 2017

Figure 10

Q:\Vancouver\Drafting\Environmental\VEN\ENW.VENW03093-01\ENW.VENW03093-01 PAH Sections R0a.dwg [FIGURE 10] December 20, 2017 - 10:00:07 am (BY: HALL, ROBERT J)



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL
16TP34

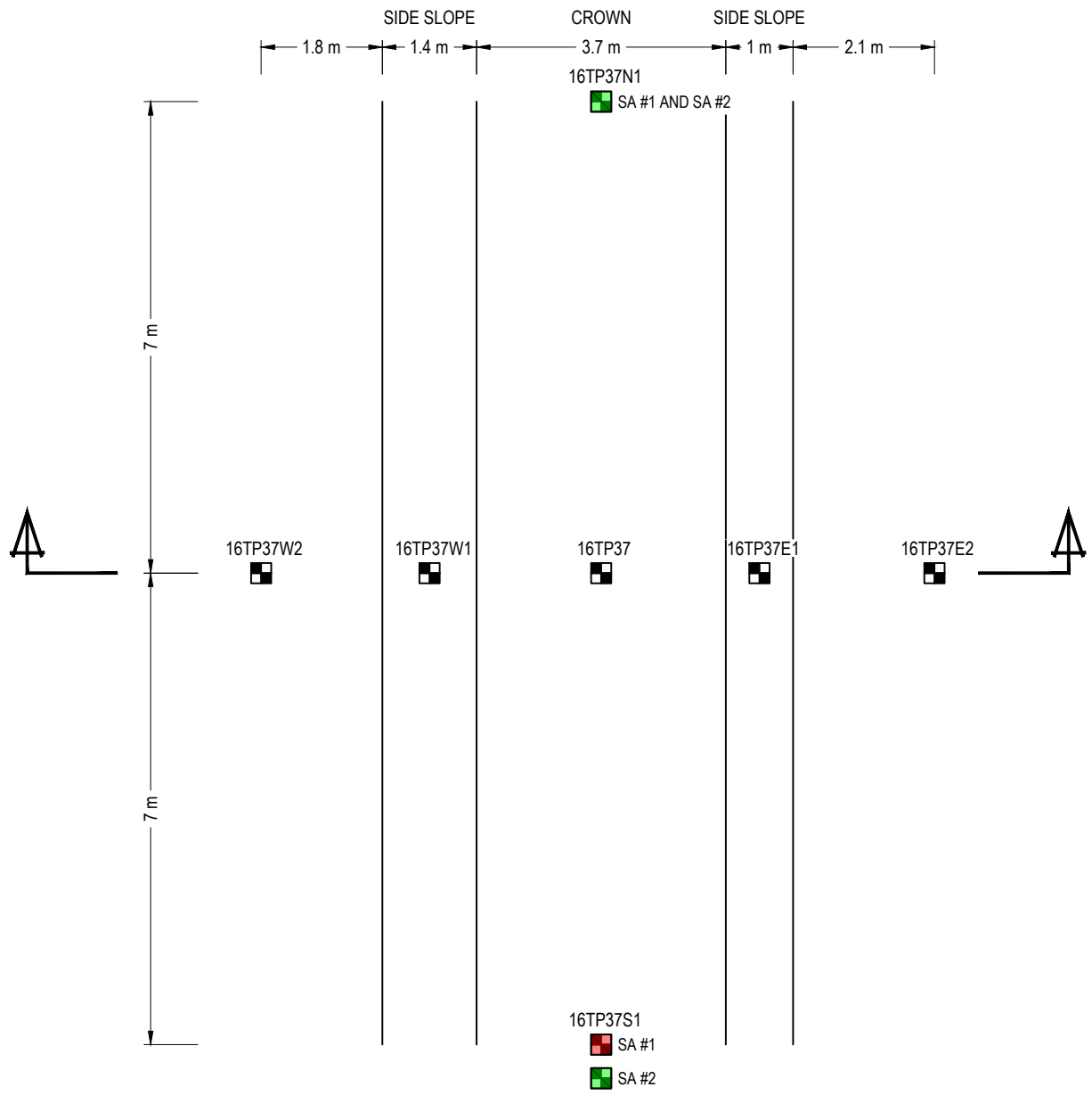
TETRA TECH

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

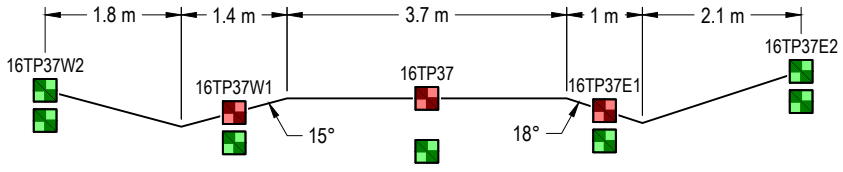
OFFICE	DATE
VANC	December 20, 2017

Figure 11

Q:\Vancouver\Drafting\Environmental\VENW\ENW.VENW03093-01\ENW.VENW03093-01 PAH Sections R0a.dwg [FIGURE 11] December 20, 2017 - 10:00:12 am (BY: HALL, ROBERT J)



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

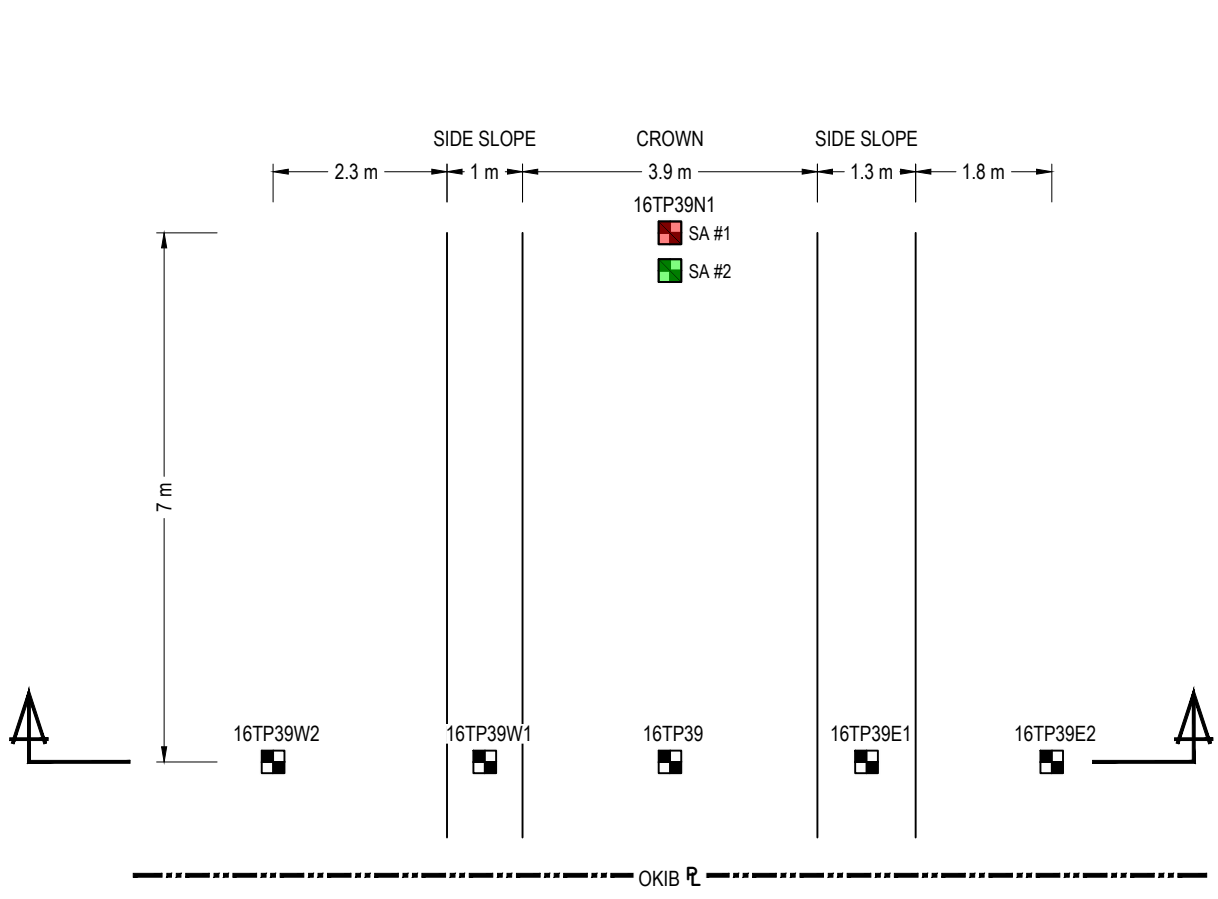
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL 16TP37

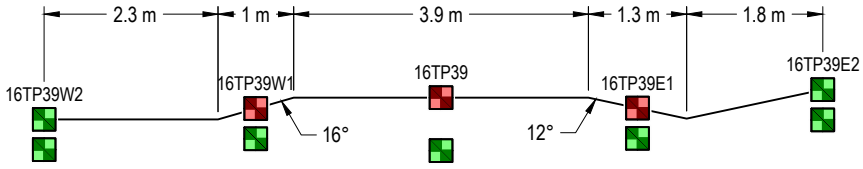
PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 12



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- PAH concentrations in soil exceeds CCME Residential, Park and Commercial Guidelines
- PAH concentrations in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

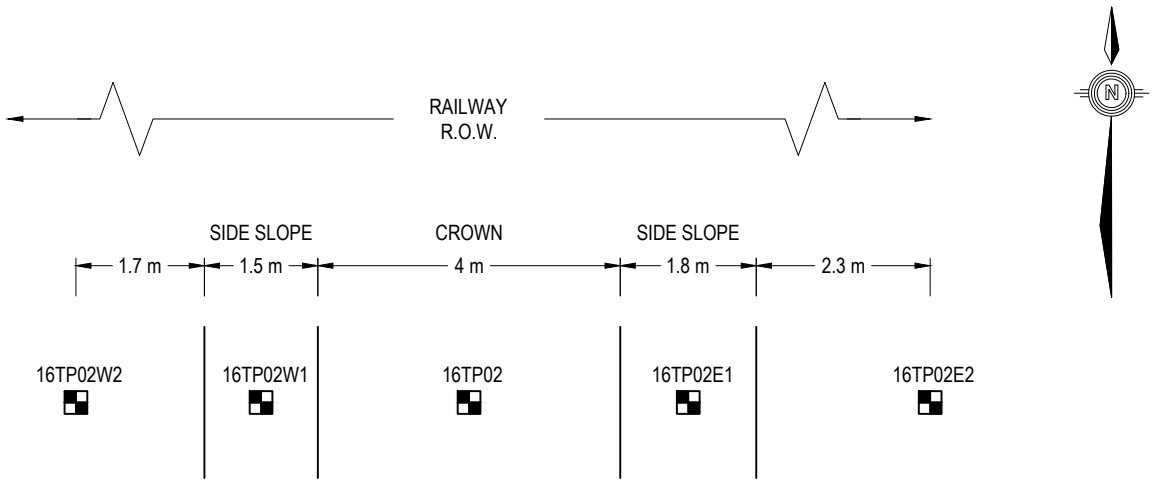
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

PAH CONCENTRATIONS IN SOIL
16TP39

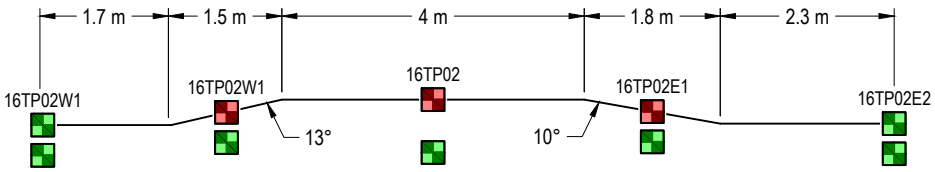
PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 13



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

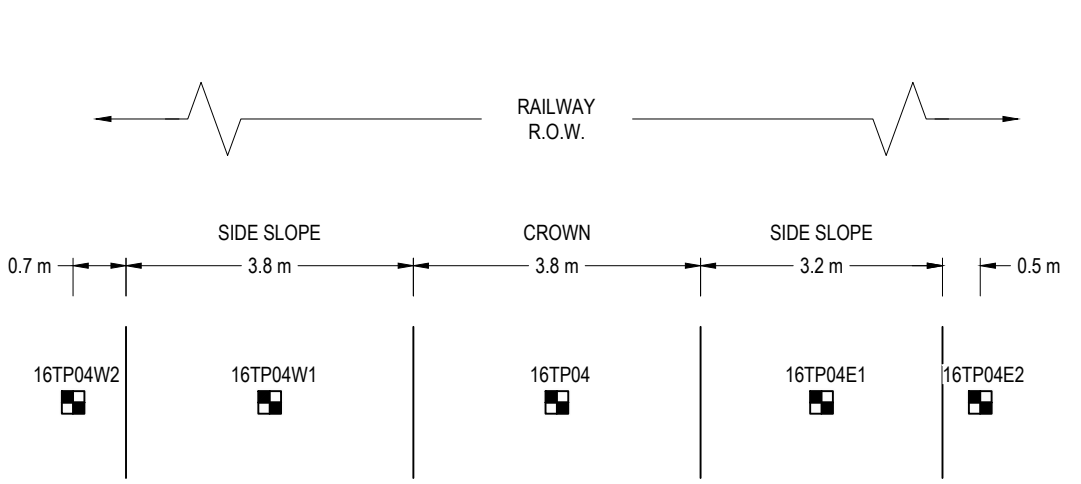
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL
16TP02

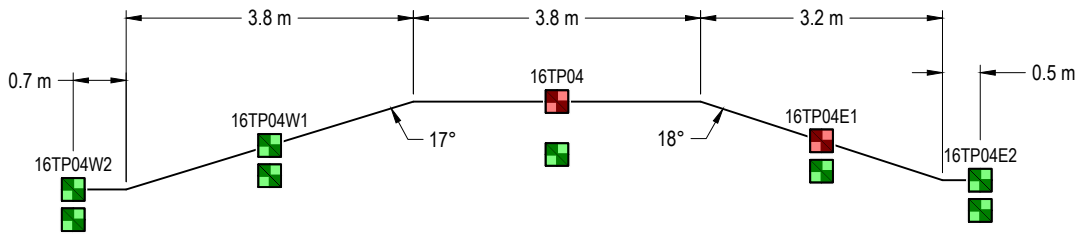
PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 14



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

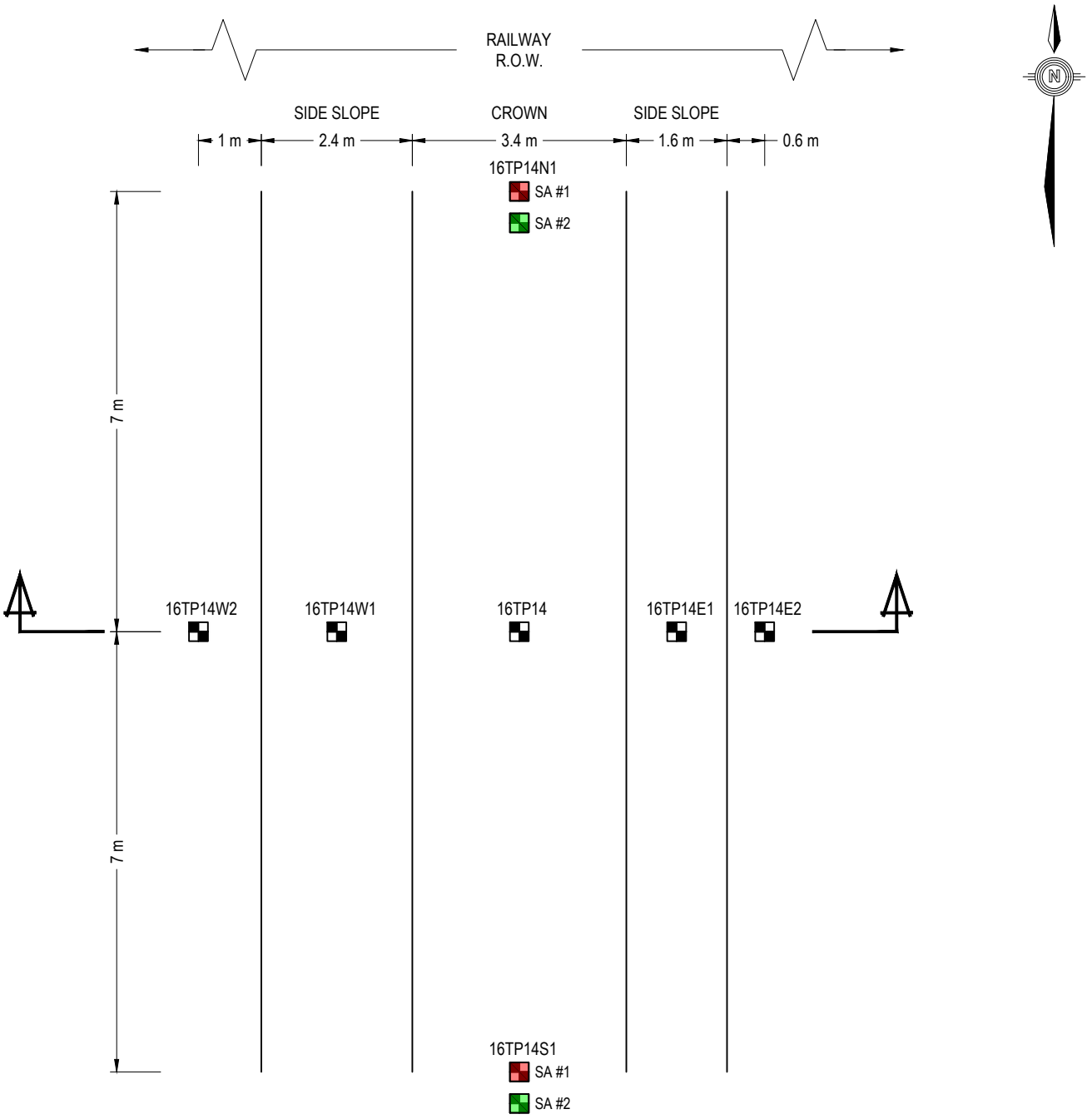
COPPER CONCENTRATION IN SOIL
16TP04

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 15

Q:\Vancouver\Drafting\Environmental\VENW\ENW.VENW03093-01\ENW.VENW03093-01 Copper Sections R0a.dwg [FIGURE 15] December 20, 2017 - 10:00:32 am (BY: HALL, ROBERT J)



ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

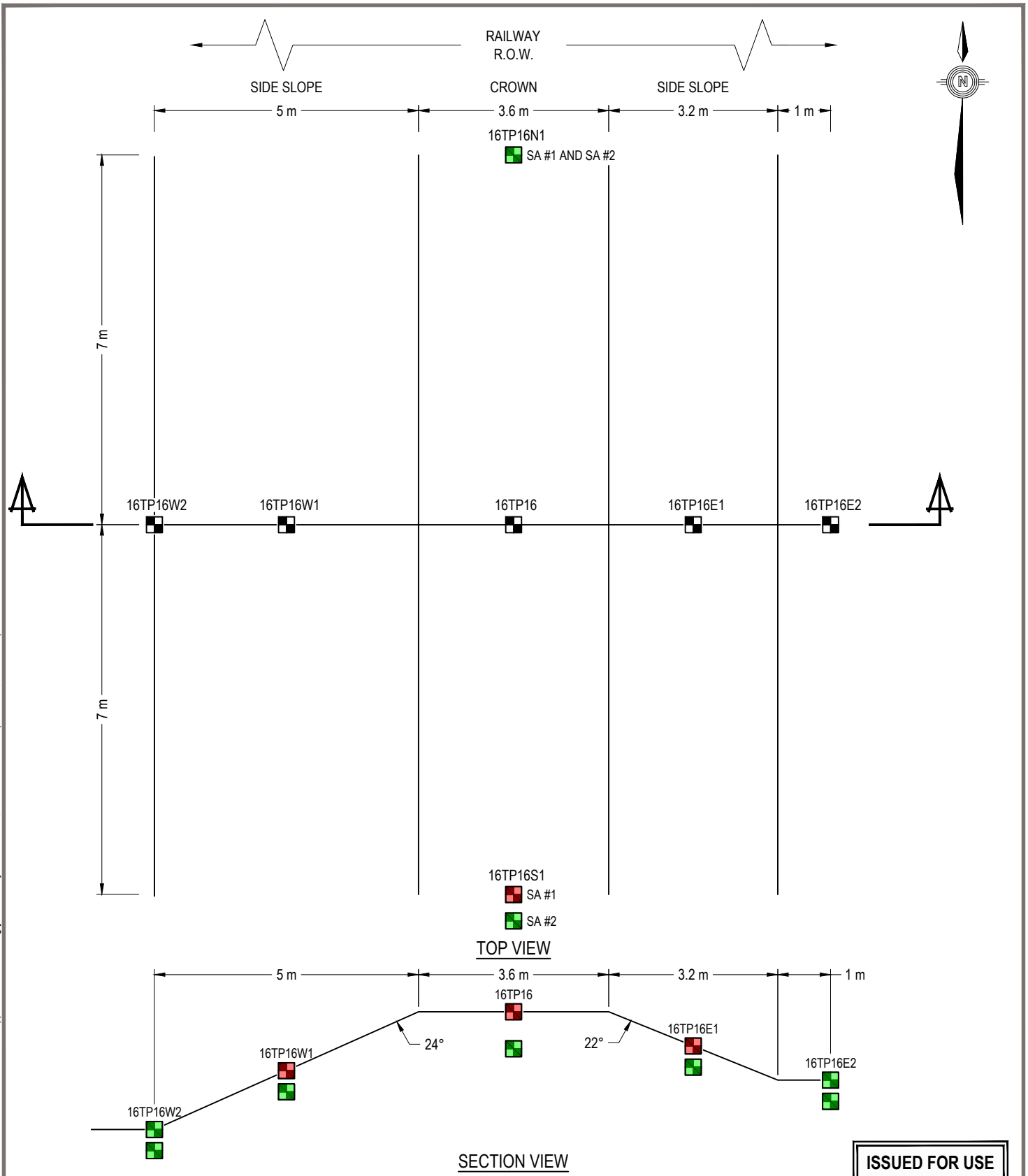
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL 16TP14

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 16



ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

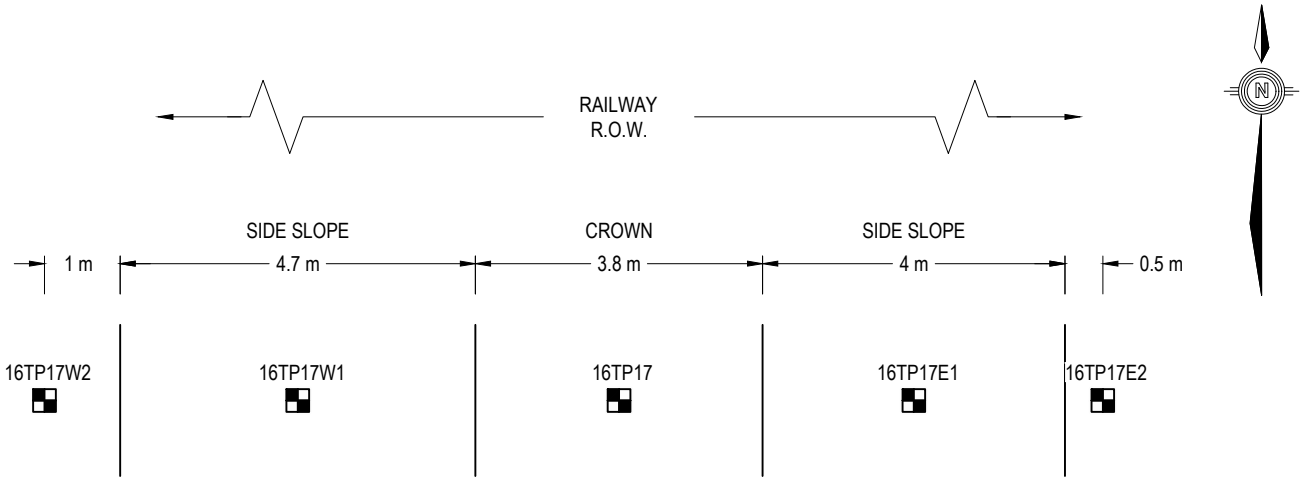
COPPER CONCENTRATION IN SOIL 16TP16

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

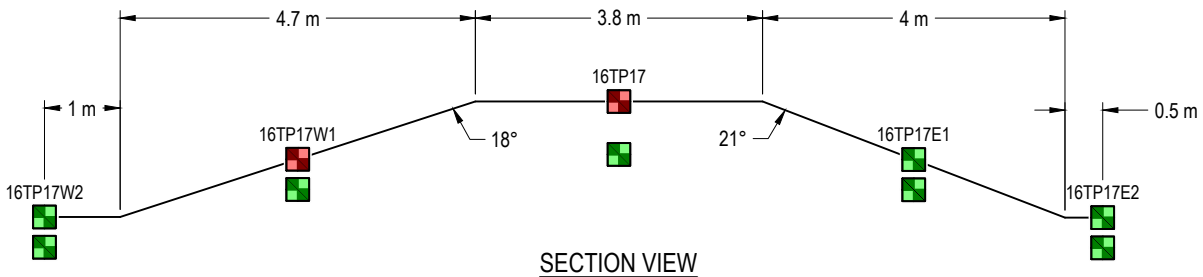
OFFICE	DATE
VANC	December 20, 2017

Figure 17

Q:\Vancouver\Drafting\Environmental\VENW\ENW.VENW03093-01\ENW.VENW03093-01 Copper Sections R0a.dwg [FIGURE 17] December 20, 2017 - 10:00:42 am (BY: HALL, ROBERT J)



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

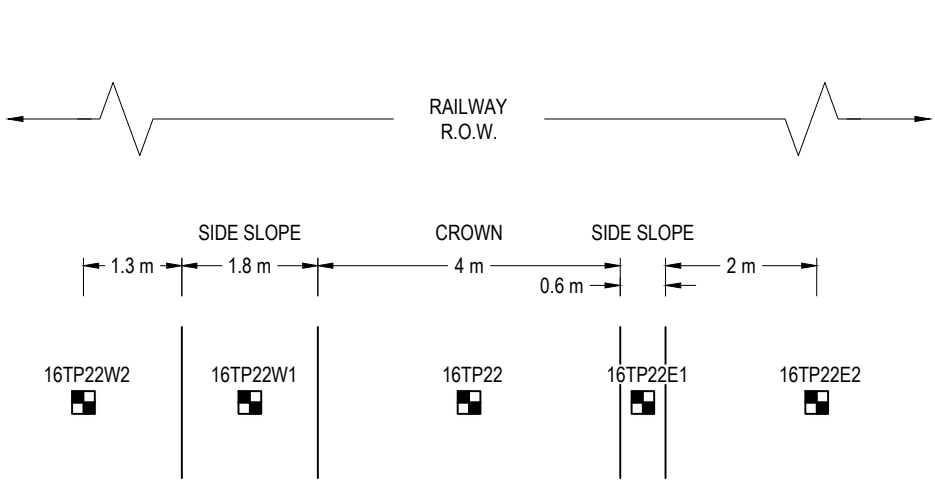
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL
16TP17

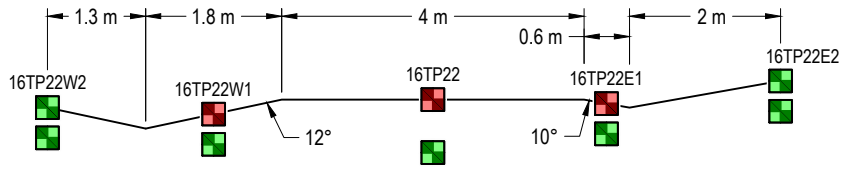
PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 18



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND
- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

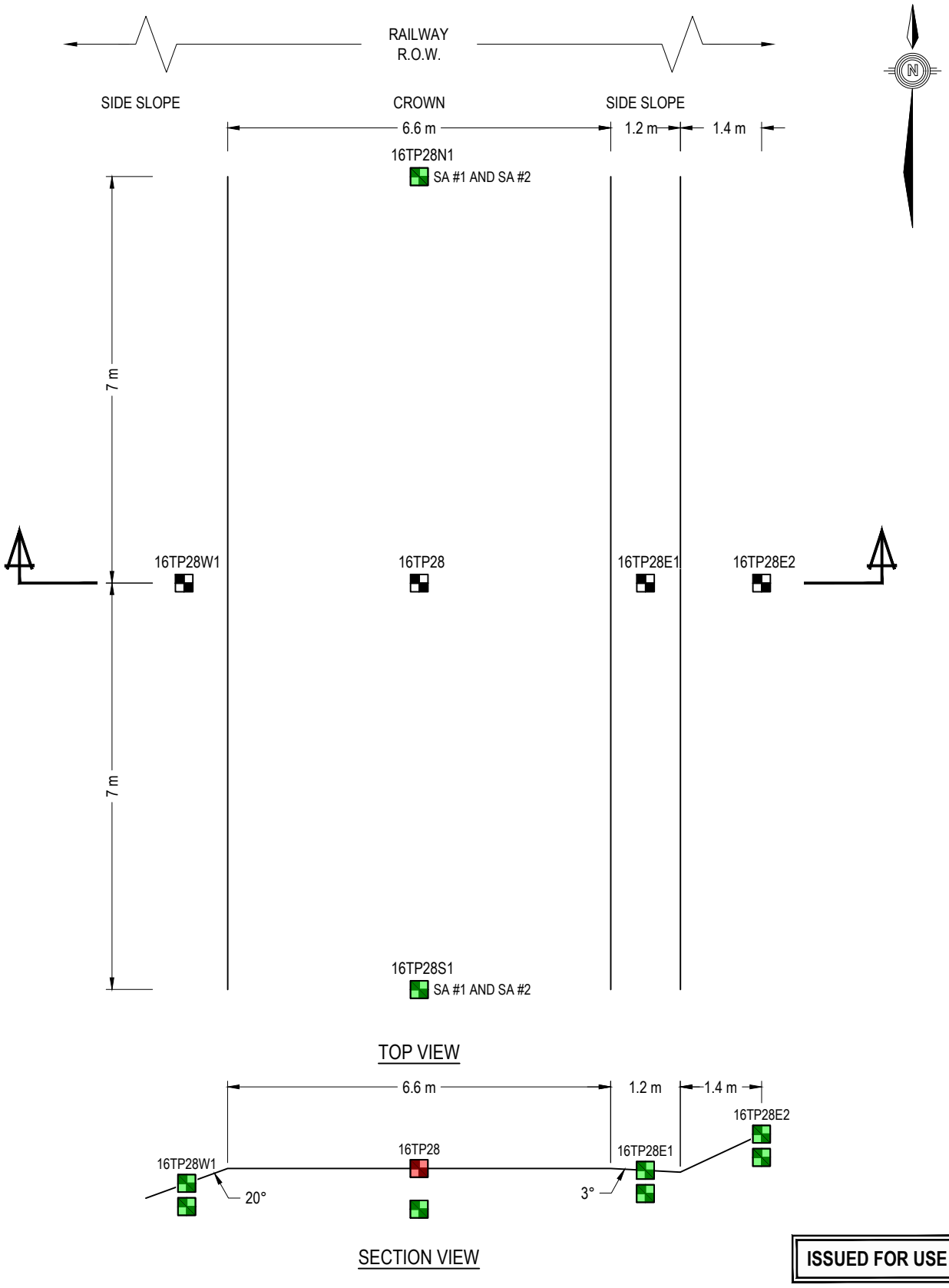
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL
16TP22

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 19



ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

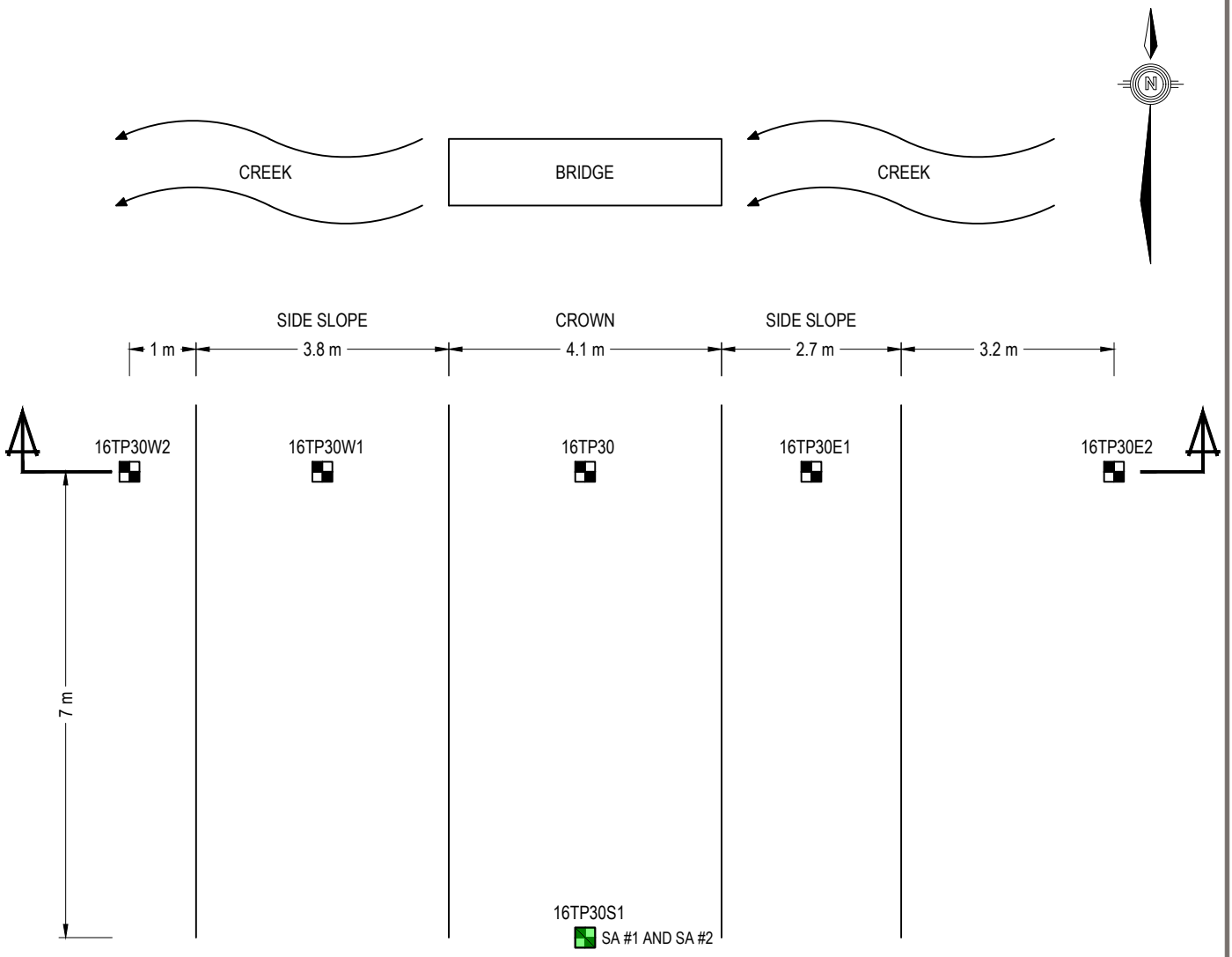
COPPER CONCENTRATION IN SOIL 16TP28

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

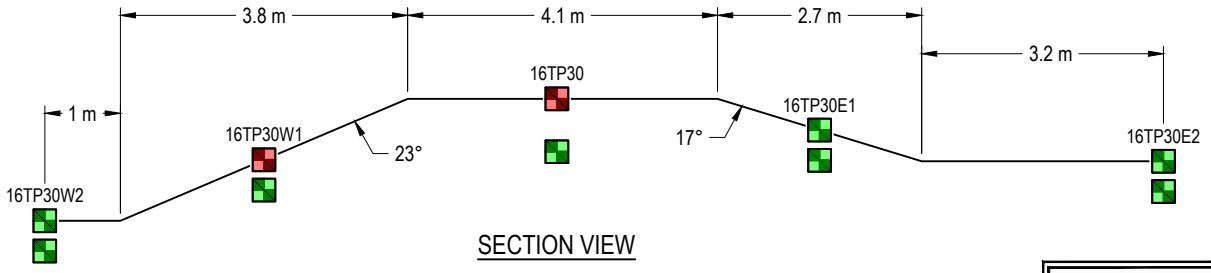
OFFICE	DATE
VANC	December 20, 2017

Figure 20

Q:\Vancouver\Drafting\Environmental\VENW\ENW.VENW03093-01\ENW.VENW03093-01 Copper Sections R0a.dwg [FIGURE 20] December 20, 2017 - 10:00:57 am (BY: HALL, ROBERT J)



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL
16TP30

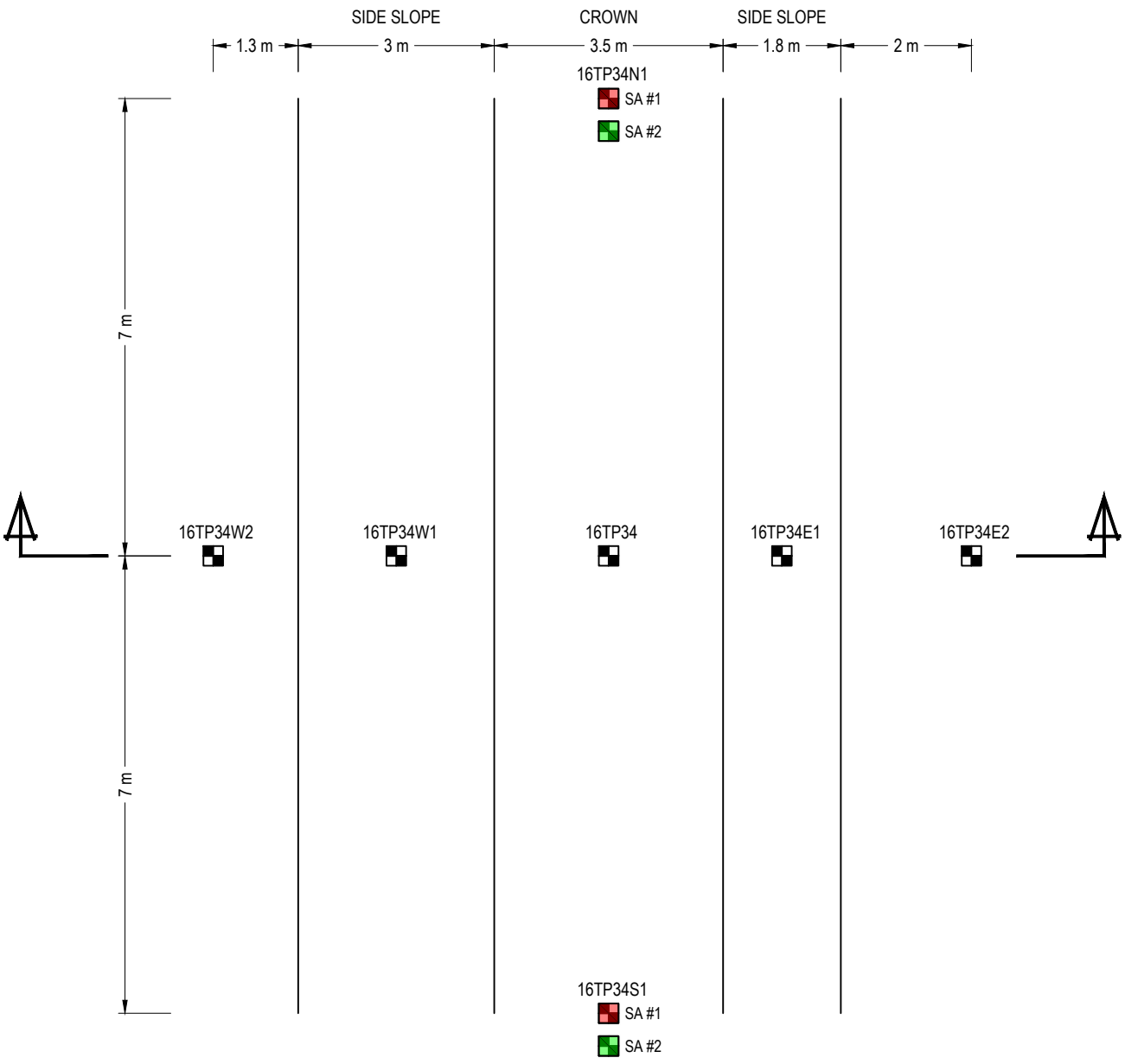
TETRA TECH

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

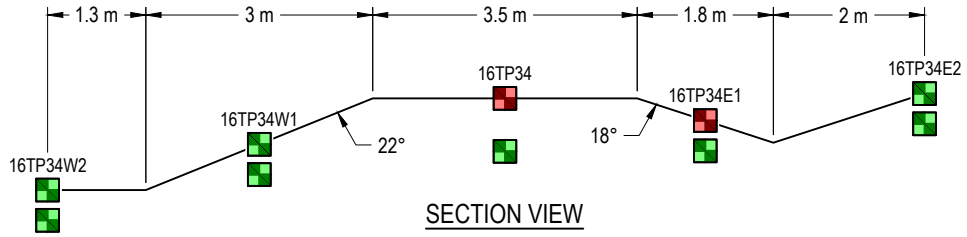
OFFICE	DATE
VANC	December 20, 2017

Figure 21

Q:\Vancouver\Drafting\Environmental\VENW\ENW.VENW03093-01\ENW.VENW03093-01 Copper Sections R0a.dwg [FIGURE 21] December 20, 2017 - 10:01:02 am (BY: HALL, ROBERT J)



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL
16TP34

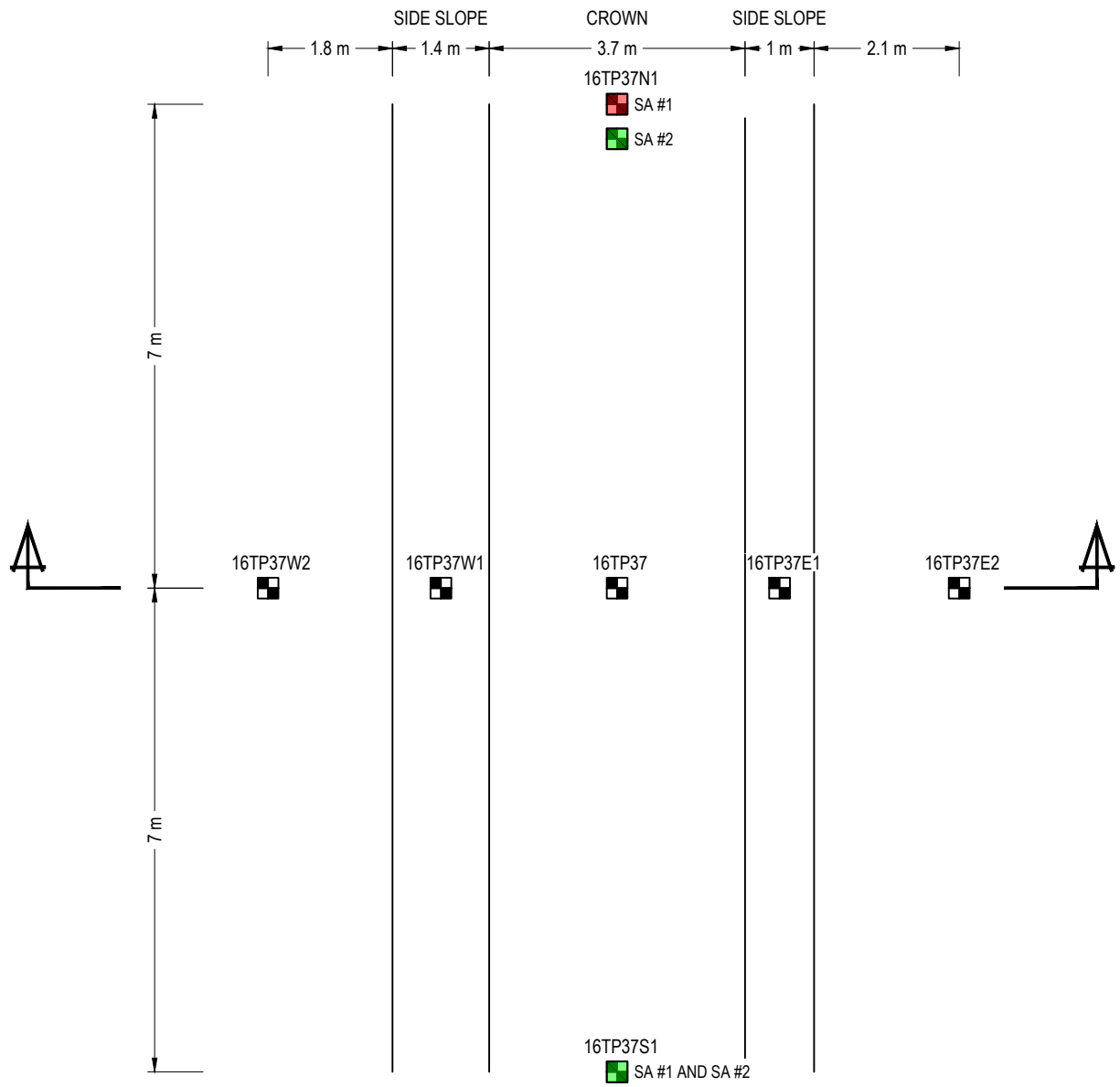
TETRA TECH

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

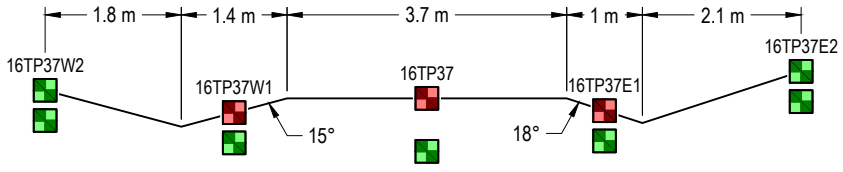
OFFICE	DATE
VANC	December 20, 2017

Figure 22

Q:\Vancouver\Drafting\Environmental\VENW\ENW.VENW03093-01\ENW.VENW03093-01 Copper Sections R0a.dwg [FIGURE 22] December 20, 2017 - 10:01:07 am (BY: HALL, ROBERT J)



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

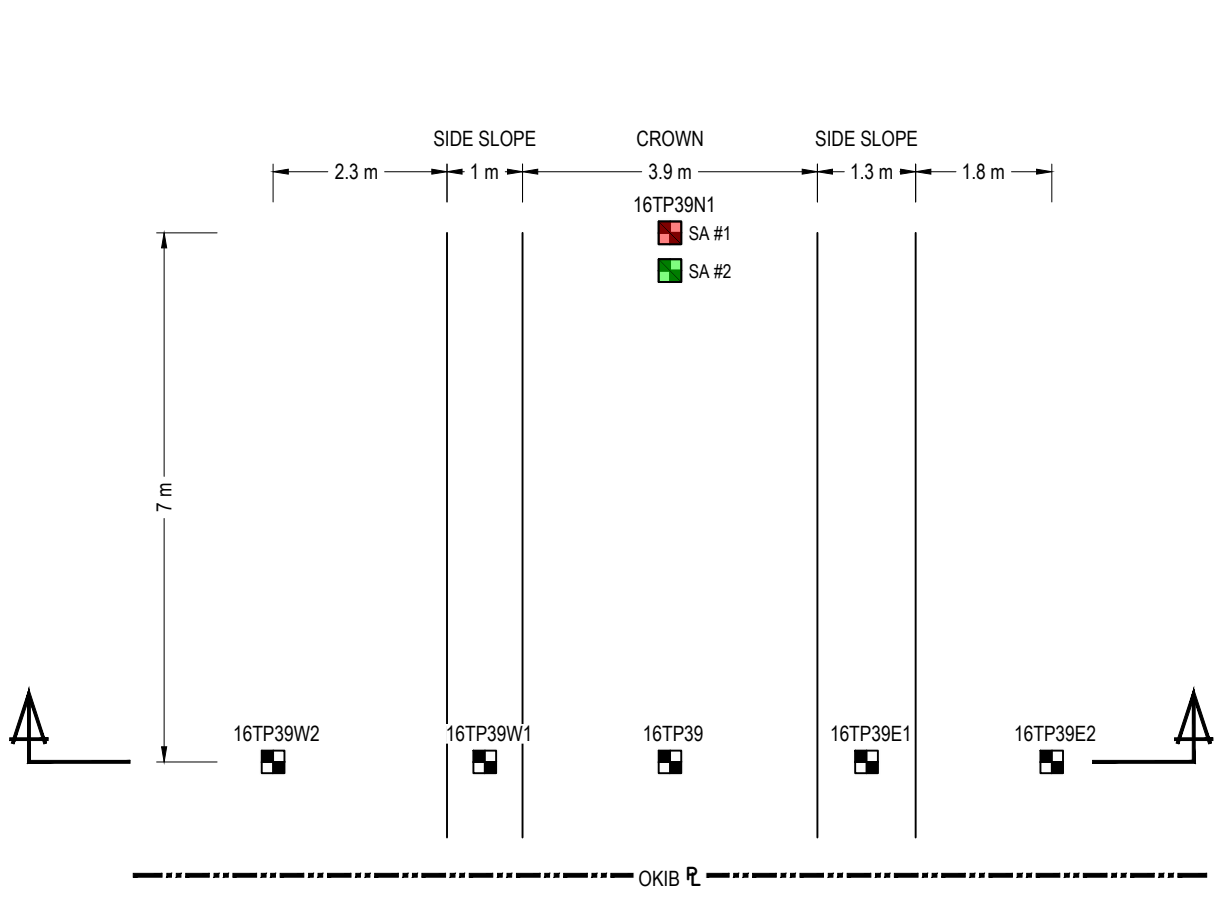
PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL
16TP37

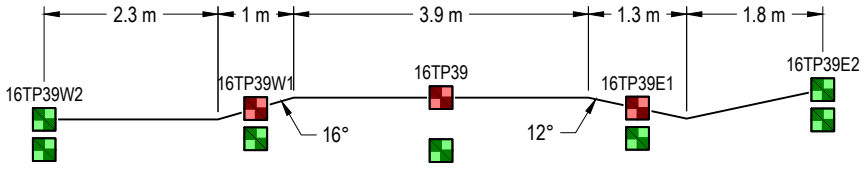
PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 23



TOP VIEW



SECTION VIEW

ISSUED FOR USE

LEGEND

- Soil sample locations
- Copper concentration in soil exceeds CCME Residential, Park and Commercial Guidelines
- Copper concentration in soil less than CCME Residential, Park and Commercial Guidelines

VERTICAL SCALE 1:100

1 0 1 2 4m

HORIZONTAL SCALE 1:100

1 0 1 2 4m

CLIENT

OKANAGAN INDIAN BAND AND INDIGENOUS AND NORTHERN AFFAIRS CANADA

TETRA TECH

PHASE III ESA - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

COPPER CONCENTRATION IN SOIL
16TP39

PROJECT NO.	DWN	CKD	REV
ENW.VENW03093-01	RH	DW	0

OFFICE	DATE
VANC	December 20, 2017

Figure 24

APPENDIX B
GROUNDWATER QUALITY INVESTIGATION

BOREHOLE DRILLING AND MONITORING WELL INSTALLATION

On March 24 and 25, 2018, four boreholes (18MW101 to 18MW04) were advanced along the Canadian National (CN) rail way right-of-way (RoW) that lies within the boundaries of the Duck Lake Indian Reserve (IR) 7 located near the northern limits of Kelowna, BC; specifically, CN Mile 105.9 to 106.6 and Mile 107.0 to 107.5. The boreholes were drilled using a truck-mounted ODEX drill rig supplied and operated by Mud Bay Drilling Co. Ltd., and were advanced to depths ranging from 4.27 mbgs to 13.72 mbgs.

During drilling, soil stratigraphy was logged based on the observations of the cuttings blown out between the outer casing and the inner hammer rod. No soil samples were collected for analyses. Borehole logs are attached.

The installation of groundwater monitoring wells Nos. 18MW01, 18MW02, 18MW03, and 18MW04 was completed by Mud Bay at the borehole locations as instructed by Tetra Tech. Monitoring wells were installed immediately following drilling. The monitoring wells were installed to depths ranging from 3.5 m to 10.55 m bgs. Monitoring wells were constructed using 50 mm diameter, screw-jointed Schedule 40 polyvinyl chloride casing, which was factory washed and bagged to prevent contamination prior to use at the site. A 1.52 m long well screen was constructed using a length of machine-slotted screen (0.010 inch openings) below unslotted riser pipe. The screens were surrounded by a silica sand filter pack where native soils had not sloughed in around the screen. The silica sand filter pack extended to approximately 0.3 m above the top of the screen. Bentonite pellets were placed above the sand, as per the attached borehole logs. Each monitoring well was topped with approximately 0.5 m of silica sand, 0.3 m of cement, and completed with a flush-mounted monument. The locations of the monitoring wells are shown on Figure B-1.

WELL DEVELOPMENT, PURGING, AND SAMPLING

Tetra Tech developed the four installed groundwater monitoring wells to remove water and sediment introduced during the drilling and well installation process, and to improve the hydraulic connection with the surrounding aquifer material. On April 10, 2018, the groundwater wells were monitored and developed as follows:

- Total well depth and depth to groundwater (measured from the top of well casing) was measured within each monitoring well to determine the volume of water within the well; and
- Monitoring wells were developed by removing at least six well volumes of water, or until purged dry at least six times, or until groundwater was running clear using a dedicated High-Density Polyethylene (HDPE) tubing attached to a four-stage submersible pump.

Table 2-2 below provides specific development details for each groundwater monitoring well.

Table 2-2: Well Development Details for Groundwater Wells

Monitoring Well	Approximate Well Volumes / Litres of Groundwater Removed During Well Development (April 10, 2018)	Screen Depth (mbgs)	Method	Notes
18MW01	4.24 volumes / 77.4 L	9.03 – 10.55	HDPE Tubing with a submersible pump	▪ Well volume prior to development was 4.24 L. ▪ Very good recharge. ▪ High turbidity at the beginning, clearing by the end of development. ▪ No noticeable hydrocarbon odour or visible sheen was noted.

Table 2-2: Well Development Details for Groundwater Wells

Monitoring Well	Approximate Well Volumes / Litres of Groundwater Removed During Well Development (April 10, 2018)	Screen Depth (mbgs)	Method	Notes
18MW02	2.29 volumes / 150 L	8.85 – 10.27	HDPE Tubing with a submersible pump	▪ Well volume prior to development was 2.29 L. ▪ Very good recharge. ▪ High turbidity at the beginning, clearing by the end of development. ▪ No noticeable hydrocarbon odour or visible sheen was noted.
18MW03	4.43 volumes / 158 L	1.9 – 3.5	HDPE Tubing with a submersible pump	▪ Well volume prior to development was 4.43 L. ▪ Very good recharge. ▪ High turbidity at the beginning, clearing by the end of development. ▪ No noticeable hydrocarbon odour or visible sheen was noted.
18MW04	4.2 volumes / 150 L	8.83 – 10.35	HDPE Tubing with a submersible pump	▪ Well volume prior to development was 4.2 L. ▪ Very good recharge. ▪ High turbidity at the beginning, clearing by the end of development. ▪ No noticeable hydrocarbon odour or visible sheen was noted.

WELL PURGING AND GROUNDWATER SAMPLING

Following well developing, two groundwater purging and sampling events were completed on April 12, 2018, and June 16, 2018, the wells were purged before sampling using a low-flow sampling technique. The low-flow sampling technique was carried out by inserting new 6.3 mm (0.25 inch) diameter high-density polyethylene (HDPE) tubing into each well with its intake at the calculated saturated interval midpoint, or at the midpoint of the well screen if the water level in the well is above the screen depth. Water is then purged from each well at a rate not exceeding 100 mL/min using a peristaltic pump. The depth to groundwater was monitored in the well during purging to confirm that the purging rate was sufficiently low and that the static elevation of groundwater in the well was not appreciably drawn down during purging and sampling. The low flow sampling technique helps to ensure the properties of the water being sampled are representative of the water in the formation around the well.

Physical parameters of the purged groundwater (i.e., temperature, pH, and electrical conductivity (EC), are measured during purging. The wells were sampled when all these physical parameters stabilized within 10% and the water level decreased by less than 0.1 m for three consecutive readings during purging.

Tetra Tech followed its standard QA/QC procedures during sampling to obtain representative groundwater samples and to minimize the potential for cross contamination. Groundwater samples were collected and submitted to CARO Analytical Services for analysis of PAHs and dissolved copper. Samples collected for PAH analyses were preserved in the field using laboratory supplied and measured aliquots of sodium bisulfate. Samples collected for dissolved copper analysis were field filtered and preserved with nitric acid supplied by the laboratory. Samples for PAHs were collected into one laboratory supplied 250 mL amber glass bottles with Teflon-lined caps. Dissolved copper samples were collect in one laboratory supplied 100 mL acid washed plastic bottle.

Groundwater samples were placed into new, clean, and labelled sample bottles supplied by CARO Analytical Services. The groundwater samples were stored in ice-chilled coolers, and submitted in-person to CARO Analytical Services using chain-of-custody procedures.

Table 1: Depths to Groundwater

Monitoring Well	Easting (m)	Northing (m)	Depth to Groundwater (m-btoc) [1]	
			12-Apr-18	6-Jun-18
18MW01	328170	5543538	8.43	7.48
18MW02	328313	5542984	9.22	8.98
18MW03	328784	5541894	1.29	1.69
18MW04	328929	55431269	8.25	7.80

NOTES

[1] m-btoc indicates metres below top of PVC casing.

Table 3: Groundwater Quality Assurance/Quality Control Analytical Results

			Field ID	18MW01	Dup #1	RPD (%)	18MW01	DUP#2	RPD (%)
			Sample Date	12-Apr-2018	12-Apr-2018		6-Jun-2018	6-Jun-2018	
			Laboratory Report Number	8041171	8041171		8060739	8060739	
			Laboratory Sample ID	8041171-01	8041171-05		8060739-01	8060739-05	
Parameter	**Unit**	**RDL**							
Dissolved Metals									
Copper	µg/L	0.4		0.42	0.46	-	4.59	5.22	13
Polycyclic Aromatic Hydrocarbons (PAHs)									
Acenaphthene	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
Acenaphthylene	µg/L	0.2		<0.20	<0.20	-	<0.20	<0.20	-
Acridine	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
Anthracene	µg/L	0.01		<0.010	<0.010	-	<0.010	<0.010	-
Benz(a)anthracene	µg/L	0.01		<0.010	<0.010	-	<0.010	<0.010	-
Benzo(a)pyrene	µg/L	0.01		<0.010	<0.010	-	<0.010	<0.010	-
Benzo(b+j)fluoranthene	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
Benzo(g,h,i)perylene	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
Benzo(k)fluoranthene	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
2-Chloronaphthalene	µg/L	0.1		<0.10	<0.10	-	<0.10	<0.10	-
Chrysene	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
Dibenz(a,h)anthracene	µg/L	0.01		<0.010	0.017	-	<0.010	<0.010	-
Fluoranthene	µg/L	0.03		<0.030	<0.030	-	<0.030	<0.030	-
Fluorene	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-
1-Methylnaphthalene	µg/L	0.1		<0.10	<0.10	-	<0.10	<0.10	-
2-Methylnaphthalene	µg/L	0.1		<0.10	<0.10	-	<0.10	<0.10	-
Naphthalene	µg/L	0.2		<0.20	<0.20	-	<0.20	<0.20	-
Phenanthrene	µg/L	0.1		<0.10	<0.10	-	<0.10	<0.10	-
Pyrene	µg/L	0.02		<0.020	<0.020	-	<0.020	<0.020	-
Quinoline	µg/L	0.05		<0.050	<0.050	-	<0.050	<0.050	-

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (abs(C1-C2)/average(C1+C2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results are less than detection limits or within 5 times the detection limits.

BOLD - RPD value greater than 30%

Table 2: Groundwater Analytical Results

						Location	18MW01				18MW02		18MW03		18MW04	
						Field ID	18MW01	Dup #1	18MW01	DUP#2	18MW02	18MW02	18MW03	18MW03	18MW04	18MW04
						Sample Date	12-Apr-2018	12-Apr-2018	6-Jun-2018	6-Jun-2018	13-Apr-2018	6-Jun-2018	12-Apr-2018	6-Jun-2018	12-Apr-2018	6-Jun-2018
						Laboratory Report Number	8041171	8041171	8060739	8060739	8041171	8060739	8041171	8060739	8041171	8060739
						Laboratory Sample ID	8041171-01	8041171-05	8060739-01	8060739-05	8041171-02	8060739-02	8041171-03	8060739-03	8041171-04	8060739-04
Parameter	**Unit**	**Canadian Drinking Water[1]**		**FIGQG[2]**	**BC CSR[3]**											
		MAC	**Other**		**Fresh AW**	**DW**										
Dissolved Metals																
Copper	µg/L	-	1000	2[4]	20[4]	1500	0.42	0.46	**4.59**	**5.22**	0.66	0.69	1.75	0.99	1.37	1.36
Polycyclic Aromatic Hydrocarbons (PAHs)																
Acenaphthene	µg/L	-	-	5.8	60	250	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthylene	µg/L	-	-	46	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Acridine	µg/L	-	-	0.05	0.5	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Anthracene	µg/L	-	-	0.012	1	1000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benz(a)anthracene	µg/L	-	-	0.018	1	0.07	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene	µg/L	0.04	-	0.015	0.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b+j)fluoranthene	µg/L	-	-	0.48	-	0.07	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(g,h,i)perylene	µg/L	-	-	0.17	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(k)fluoranthene	µg/L	-	-	0.48	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-Chloronaphthalene	µg/L	-	-	-	-	300	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chrysene	µg/L	-	-	1.4	1	7	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibenz(a,h)anthracene	µg/L	-	-	0.26	-	0.01	<0.010	**0.017**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene	µg/L	-	-	0.04	2	150	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Fluorene	µg/L	-	-	3	120	150	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Indeno(1,2,3-c,d)pyrene	µg/L	-	-	0.21	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1-Methylnaphthalene	µg/L	-	-	180	-	5.5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2-Methylnaphthalene	µg/L	-	-	180	-	15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Naphthalene	µg/L	-	-	1.1	10	80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Phenanthrene	µg/L	-	-	0.4	3	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Pyrene	µg/L	-	-	0.025	0.2	100	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Quinoline	µg/L	-	-	3.4	34	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:

[1] Health Canada Federal-Provincial-Territorial Committee on Drinking Water (February 2017). Guidelines for Canadian Drinking Water Quality Summary Table (GCDWQ)
MAC refers to the Maximum Acceptable Concentration according to the GCDWQ criteria.
Other Value refers to the aesthetic objectives or operational guidance values according to the GCDWQ criteria.

[2] Environment Canada (November 2015). Guidance Document on Federal Interim Groundwater Quality Guidelines (FIGQG) for Federal Contaminated Sites, Tier 2 Freshwater Life pathway only, fine and coarse soil type, most conservative value shown

[3] BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 253/2016, November 1, 2017) Schedule 3.2 Generic Numerical Water Standards for Freshwater Aquatic Life (AW) and Drinking Water (DW)

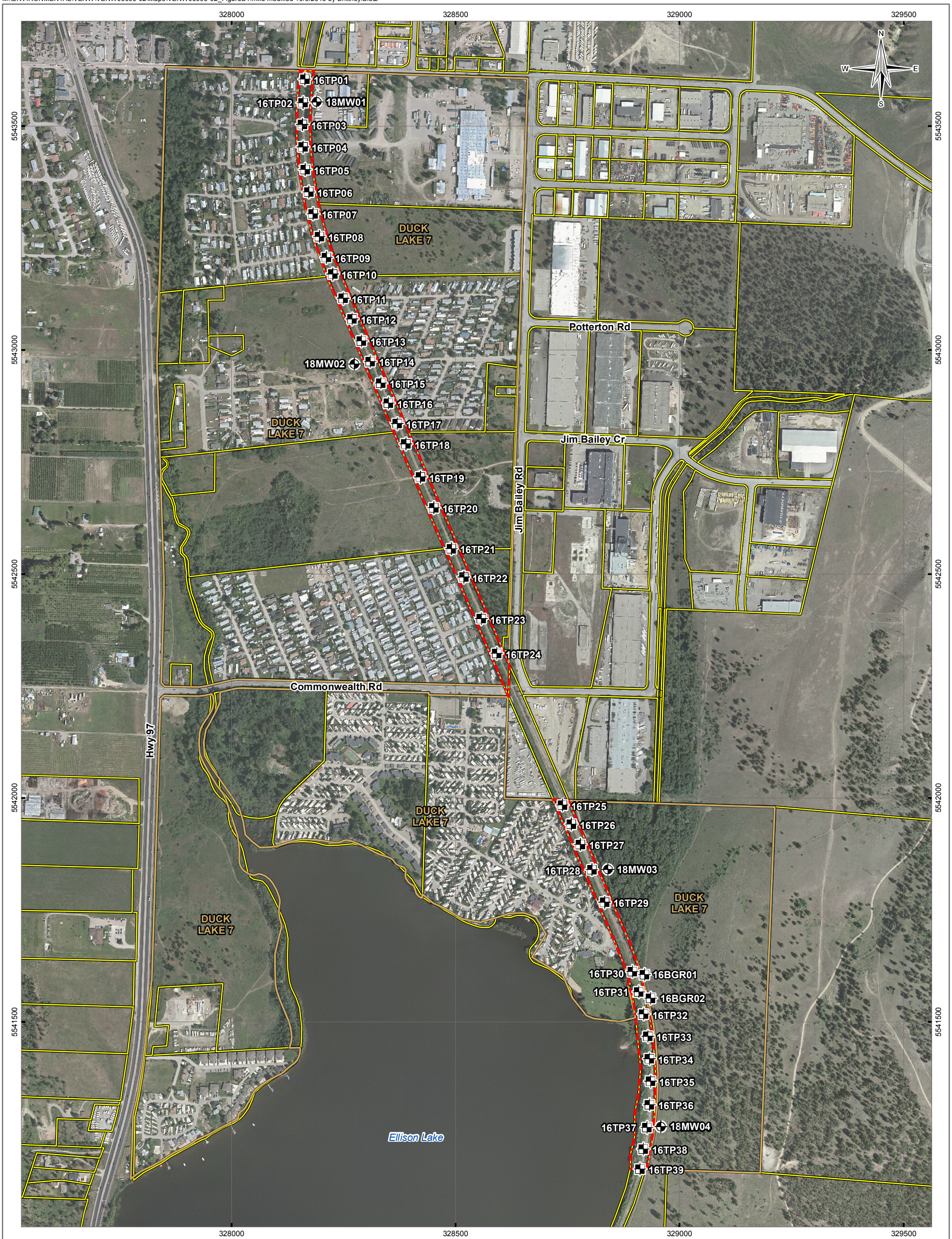
[4] Guideline/standard varies with hardness. Most conservative value applied

"-" No applicable guideline

BOLD - Greater than GCDWQ, FIGQG, or CSR Guideline

TETRA TECH

M:\ENVIRONMENTAL\VENW\VENW03093-02\Maps\VENW03093-02_FigureB1.mxd modified 10/3/2018 by Brittney.Bietz



LEGEND

- Testpit
- Groundwater Monitoring Well
- Site Boundary
- Parcel Boundary
- IR Boundary

NOTES
Base data source:
Indian Reserve Administrative Boundaries provided by DataBC.
Parcel boundaries and 2015 imagery provided by the City of Kelowna.

STATUS
ISSUED FOR USE

GROUNDWATER QUALITY INVESTIGATION - CN RAIL ROW
MILE 105.9 TO 106.6 AND MILE 107.0 TO 107.5
DUCK LAKE IR 7

Groundwater Monitoring Well Location Plan

PROJECTION	DATUM	CLIENT
UTM Zone 11	NAD83	Okanagan Indian Band, Indigenous and Northern Affairs Canada and CN Railway

Scale: 1:8,000
100 50 0 100
Metres

FILE NO.
VENW03093-02_FigureB1.mxd

PROJECT NO.	DWN	CKD	APVD	REV
ENW.VENW03093-02	BB	SL	DW	0

OFFICE	DATE
Tt EBA-CAL	June 28, 2018

TETRA TECH EBA

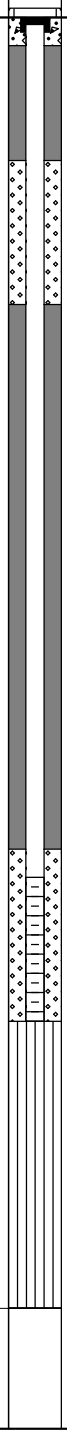
Figure B-1

Borehole No: **18MW01**

Okanagan Indian Band

Project: Risk Assessment - GW Investigation	Project No: ENW.VENW03093-02
Location: CN ROW, Mile 105.9 - 106.6 and 107.0 - 108.5	
Kelowna, British Columbia	

Depth (m)	Method	Soil Description	Sample Type	Sample Number	Notes and Comments
0		TOPSOIL			Road box and cement
		SAND - trace silt, dry, medium brown, fine sand, no visible staining, no discernible hydrocarbon odour			
1		SAND AND GRAVEL - trace silt, dry, medium brown, no visible staining, no discernible hydrocarbon odour			
2					
3				SA1	
4		GRAVEL - sandy, trace silt, dry, light to medium brown, no visible staining, no discernible hydrocarbon odour			
5					
6	Solid stem auger			SA2	
7					
8		- occasional cobble			
9		- some silt		SA3	
10					
11					
12				SA4	
13					
14		END OF BOREHOLE (13.72 metres) slough - 10.67 metres Monitoring well installed to 10.67 metres			
15					



Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48

TETRA TECH

Contractor: Mud Bay Drilling Ltd.	Completion Depth: 13.72 m
Drilling Rig Type: Truck mounted	Start Date: 2018 March 24
Logged By: CC	Completion Date: 2018 March 24
Reviewed By: DW	Page 1 of 1

Borehole No: **18MW02**

Okanagan Indian Band

Project: Risk Assessment - GW Investigation	Project No: ENW.VENW03093-02
Location: CN ROW, Mile 105.9 - 106.6 and 107.0 - 108.5	
Kelowna, British Columbia	

Depth (m)	Method	Soil Description	Sample Type	Sample Number	Notes and Comments	Depth (ft)
0						0
	Solid stem auger	TOPSOIL			Road box and cement	
		SAND - trace silt, dry, loose to compact, medium brown, fine sand, no visible staining, no discernible hydrocarbon odour				
3				SA1		10
5		SAND AND GRAVEL - trace silt, dry, compact, light to medium brown, no visible staining, no discernible hydrocarbon odour				16
6				SA2		20
9		- moist to wet		SA3		30
11		END OF BOREHOLE (10.67 metres) Monitoring well installed to 10.67 metres				36

18MW02

Contractor: Mud Bay Drilling Ltd.	Completion Depth: 10.67 m
Drilling Rig Type: Truck mounted	Start Date: 2018 March 24
Logged By: CC	Completion Date: 2018 March 24
Reviewed By: DW	Page 1 of 1

TETRA TECH

Borehole No: **18MW03**

Okanagan Indian Band

Project: Risk Assessment - GW Investigation	Project No: ENW.VENW03093-02
Location: CN ROW, Mile 105.9 - 106.6 and 107.0 - 108.5	
Kelowna, British Columbia	

Depth (m)	Method	Soil Description	Sample Type	Sample Number	Notes and Comments	18MW03	Depth (ft)
0							0
1	Solid stem auger	SAND AND GRAVEL - trace silt, dry, compact, medium brown, no visible staining, no discernible hydrocarbon odour			Road box and cement		2
2		SAND - some silt to silty, trace gravel, moist, compact, medium brown, no visible staining, no discernible hydrocarbon odour					4
3		- wet		SA1			6
4							8
5		END OF BOREHOLE (4.27 metres) Monitoring well installed to 4.27 metres					10
6							12
7							14
8							16
9							18
10							20
11							22
12							24
13							26
14							28
15							30
							32
							34
							36
							38
							40
							42
							44
							46
							48

TETRA TECH

Contractor: Mud Bay Drilling Ltd.	Completion Depth: 4.27 m
Drilling Rig Type: Truck mounted	Start Date: 2018 March 24
Logged By: CC	Completion Date: 2018 March 24
Reviewed By: DW	Page 1 of 1

Borehole No: **18MW04**

Okanagan Indian Band

Project: Risk Assessment - GW Investigation	Project No: ENW.VENW03093-02
Location: CN ROW, Mile 105.9 - 106.6 and 107.0 - 108.5	
Kelowna, British Columbia	

Depth (m)	Method	Soil Description	Sample Type	Sample Number	Notes and Comments	18MW04	Depth (ft)
0							0
0 – 3	Solid stem auger	SAND AND GRAVEL - trace silt, dry, compact, medium brown, no visible staining, no discernible hydrocarbon odour		SA1	Road box and cement		0 – 10
3 – 9	Solid stem auger	SAND - some gravel, trace silt, dry, compact, medium brown, no visible staining, no discernible hydrocarbon odour - moist, light brown		SA2			10 – 30
9 ▼	Solid stem auger			SA3			30 ▼
9 – 10.67	Solid stem auger	END OF BOREHOLE (10.67 metres) water - 9.14 metres Monitoring well installed to 10.36 metres					30 – 35
10 – 15							35 – 48

TETRA TECH

Contractor: Mud Bay Drilling Ltd.	Completion Depth: 10.67 m
Drilling Rig Type: Truck mounted	Start Date: 2018 March 25
Logged By: CC	Completion Date: 2018 March 25
Reviewed By: DW	Page 1 of 1

CERTIFICATE OF ANALYSIS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna) 150 - 1715 Dickson Ave. Kelowna, BC V1Y 9G6		
ATTENTION	Chris Chu	**WORK ORDER**	8041171
PO NUMBER		**RECEIVED / TEMP**	2018-04-13 11:50 / 6°C
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-04-20 13:12
PROJECT INFO		**COC NUMBER**	B59081

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at jnobrega@caro.ca

Authorized By:

Jessica Nobrega, B.Sc.
Client Service Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8041171
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-04-20 13:12

Analyte	Result	RL	Units	Analyzed	Qualifier
18MW01 (8041171-01) | Matrix: Water | Sampled: 2018-04-12 15:36					
Dissolved Metals					
Copper, dissolved	**0.00042**	0.00040	mg/L	2018-04-19	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-04-20	
Acenaphthylene	< 0.200	0.200	µg/L	2018-04-20	
Acridine	< 0.050	0.050	µg/L	2018-04-20	
Anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Chrysene	< 0.050	0.050	µg/L	2018-04-20	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Fluoranthene	< 0.030	0.030	µg/L	2018-04-20	
Fluorene	< 0.050	0.050	µg/L	2018-04-20	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-04-20	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Naphthalene	< 0.200	0.200	µg/L	2018-04-20	
Phenanthrene	< 0.100	0.100	µg/L	2018-04-20	
Pyrene	< 0.020	0.020	µg/L	2018-04-20	
Quinoline	< 0.050	0.050	µg/L	2018-04-20	
Surrogate: Acridine-d9	*71*	*50-140*	%	*2018-04-20*	
Surrogate: Naphthalene-d8	*85*	*50-140*	%	*2018-04-20*	
Surrogate: Perylene-d12	*92*	*50-140*	%	*2018-04-20*	
18MW02 (8041171-02) | Matrix: Water | Sampled: 2018-04-13 11:17					
Dissolved Metals					
Copper, dissolved	**0.00066**	0.00040	mg/L	2018-04-19	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-04-20	
Acenaphthylene	< 0.200	0.200	µg/L	2018-04-20	
Acridine	< 0.050	0.050	µg/L	2018-04-20	
Anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8041171
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-04-20 13:12

Analyte	Result	RL	Units	Analyzed	Qualifier
18MW02 (8041171-02) | Matrix: Water | Sampled: 2018-04-13 11:17, Continued					
Polycyclic Aromatic Hydrocarbons (PAH), Continued					
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Chrysene	< 0.050	0.050	µg/L	2018-04-20	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Fluoranthene	< 0.030	0.030	µg/L	2018-04-20	
Fluorene	< 0.050	0.050	µg/L	2018-04-20	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-04-20	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Naphthalene	< 0.200	0.200	µg/L	2018-04-20	
Phenanthrene	< 0.100	0.100	µg/L	2018-04-20	
Pyrene	< 0.020	0.020	µg/L	2018-04-20	
Quinoline	< 0.050	0.050	µg/L	2018-04-20	
Surrogate: Acridine-d9	*68*	*50-140*	%	*2018-04-20*	
Surrogate: Naphthalene-d8	*89*	*50-140*	%	*2018-04-20*	
Surrogate: Perylene-d12	*96*	*50-140*	%	*2018-04-20*	
18MW03 (8041171-03) | Matrix: Water | Sampled: 2018-04-12 17:22					
Dissolved Metals					
Copper, dissolved	**0.00175**	0.00040	mg/L	2018-04-19	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-04-20	
Acenaphthylene	< 0.200	0.200	µg/L	2018-04-20	
Acridine	< 0.050	0.050	µg/L	2018-04-20	
Anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Chrysene	< 0.050	0.050	µg/L	2018-04-20	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Fluoranthene	< 0.030	0.030	µg/L	2018-04-20	
Fluorene	< 0.050	0.050	µg/L	2018-04-20	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-04-20	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Naphthalene	< 0.200	0.200	µg/L	2018-04-20	
Phenanthrene	< 0.100	0.100	µg/L	2018-04-20	
Pyrene	< 0.020	0.020	µg/L	2018-04-20	
Quinoline	< 0.050	0.050	µg/L	2018-04-20	

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8041171
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-04-20 13:12

Analyte	Result	RL	Units	Analyzed	Qualifier
18MW03 (8041171-03) | Matrix: Water | Sampled: 2018-04-12 17:22, Continued					
Polycyclic Aromatic Hydrocarbons (PAH), Continued					
Surrogate: Acridine-d9	*72*	*50-140*	%	*2018-04-20*	
Surrogate: Naphthalene-d8	*90*	*50-140*	%	*2018-04-20*	
Surrogate: Perylene-d12	*91*	*50-140*	%	*2018-04-20*	
18MW04 (8041171-04) | Matrix: Water | Sampled: 2018-04-12 18:12					
Dissolved Metals					
Copper, dissolved	**0.00137**	0.00040	mg/L	2018-04-19	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-04-20	
Acenaphthylene	< 0.200	0.200	µg/L	2018-04-20	
Acridine	< 0.050	0.050	µg/L	2018-04-20	
Anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Chrysene	< 0.050	0.050	µg/L	2018-04-20	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Fluoranthene	< 0.030	0.030	µg/L	2018-04-20	
Fluorene	< 0.050	0.050	µg/L	2018-04-20	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-04-20	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Naphthalene	< 0.200	0.200	µg/L	2018-04-20	
Phenanthrene	< 0.100	0.100	µg/L	2018-04-20	
Pyrene	< 0.020	0.020	µg/L	2018-04-20	
Quinoline	< 0.050	0.050	µg/L	2018-04-20	
Surrogate: Acridine-d9	*73*	*50-140*	%	*2018-04-20*	
Surrogate: Naphthalene-d8	*92*	*50-140*	%	*2018-04-20*	
Surrogate: Perylene-d12	*93*	*50-140*	%	*2018-04-20*	
Dup #1 (8041171-05) | Matrix: Water | Sampled: 2018-04-12 15:40					
Dissolved Metals					
Copper, dissolved	**0.00046**	0.00040	mg/L	2018-04-19	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-04-20	
Acenaphthylene	< 0.200	0.200	µg/L	2018-04-20	

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8041171
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Analyte	Result	RL	Units	Analyzed	Qualifier
Dup #1 (8041171-05) | Matrix: Water | Sampled: 2018-04-12 15:40, Continued					
Polycyclic Aromatic Hydrocarbons (PAH), Continued					
Acridine	< 0.050	0.050	µg/L	2018-04-20	
Anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-04-20	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-04-20	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-04-20	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Chrysene	< 0.050	0.050	µg/L	2018-04-20	
Dibenz(a,h)anthracene	**0.017**	0.010	µg/L	2018-04-20	
Fluoranthene	< 0.030	0.030	µg/L	2018-04-20	
Fluorene	< 0.050	0.050	µg/L	2018-04-20	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-04-20	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-04-20	
Naphthalene	< 0.200	0.200	µg/L	2018-04-20	
Phenanthrene	< 0.100	0.100	µg/L	2018-04-20	
Pyrene	< 0.020	0.020	µg/L	2018-04-20	
Quinoline	< 0.050	0.050	µg/L	2018-04-20	
Surrogate: Acridine-d9	*73*	*50-140*	%	*2018-04-20*	
Surrogate: Naphthalene-d8	*90*	*50-140*	%	*2018-04-20*	
Surrogate: Perylene-d12	*97*	*50-140*	%	*2018-04-20*	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8041171
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-04-20 13:12

Analysis Description	Method Ref.	Technique	Location
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
Polycyclic Aromatic Hydrocarbons in Water	EPA 3511* / EPA 8270D	Hexane MicroExtraction (Base/Neutral) / GC-MSD (SIM)	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
mg/L	Milligrams per litre
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8041171
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-04-20 13:12

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B8D1195										
Blank (B8D1195-BLK1)				Prepared: 2018-04-18, Analyzed: 2018-04-18						
Copper, dissolved	< 0.00040	0.00040	mg/L							
LCS (B8D1195-BS1)				Prepared: 2018-04-18, Analyzed: 2018-04-18						
Copper, dissolved	0.0199	0.00040	mg/L	0.0200		100	80-120			
Reference (B8D1195-SRM1)				Prepared: 2018-04-18, Analyzed: 2018-04-18						
Copper, dissolved	0.835	0.00040	mg/L	0.844		99	90-115			
Polycyclic Aromatic Hydrocarbons (PAH), Batch B8D1327										
Blank (B8D1327-BLK1)				Prepared: 2018-04-19, Analyzed: 2018-04-19						
Acenaphthene	< 0.050	0.050	µg/L							
Acenaphthylene	< 0.200	0.200	µg/L							
Acridine	< 0.050	0.050	µg/L							
Anthracene	< 0.010	0.010	µg/L							
Benz(a)anthracene	< 0.010	0.010	µg/L							
Benzo(a)pyrene	< 0.010	0.010	µg/L							
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L							
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L							
Benzo(k)fluoranthene	< 0.050	0.050	µg/L							
2-Chloronaphthalene	< 0.100	0.100	µg/L							
Chrysene	< 0.050	0.050	µg/L							
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L							
Fluoranthene	< 0.030	0.030	µg/L							
Fluorene	< 0.050	0.050	µg/L							
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L							
1-Methylnaphthalene	< 0.100	0.100	µg/L							
2-Methylnaphthalene	< 0.100	0.100	µg/L							
Naphthalene	< 0.200	0.200	µg/L							
Phenanthrene	< 0.100	0.100	µg/L							
Pyrene	< 0.020	0.020	µg/L							
Quinoline	< 0.050	0.050	µg/L							
Surrogate: Acridine-d9	*3.95*		*µg/L*	4.44		*89*	*50-140*			
Surrogate: Naphthalene-d8	*3.99*		*µg/L*	4.44		*90*	*50-140*			
Surrogate: Perylene-d12	*4.43*		*µg/L*	4.44		*100*	*50-140*			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8041171
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-04-20 13:12

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Polycyclic Aromatic Hydrocarbons (PAH), Batch B8D1327, Continued										
LCS (B8D1327-BS1)				Prepared: 2018-04-19, Analyzed: 2018-04-19						
Acenaphthene	4.07	0.050	µg/L	4.40		93	58-125			
Acenaphthylene	4.24	0.200	µg/L	4.40		96	54-128			
Acridine	2.99	0.050	µg/L	4.44		67	50-112			
Anthracene	4.29	0.010	µg/L	4.44		97	66-125			
Benz(a)anthracene	4.84	0.010	µg/L	4.44		109	59-123			
Benzo(a)pyrene	4.58	0.010	µg/L	4.40		104	62-116			
Benzo(b+j)fluoranthene	9.16	0.050	µg/L	8.89		103	69-121			
Benzo(g,h,i)perylene	4.10	0.050	µg/L	4.40		93	58-129			
Benzo(k)fluoranthene	4.63	0.050	µg/L	4.44		104	67-128			
2-Chloronaphthalene	3.65	0.100	µg/L	4.44		82	50-140			
Chrysene	4.82	0.050	µg/L	4.42		109	58-125			
Dibenz(a,h)anthracene	4.14	0.010	µg/L	4.42		94	58-126			
Fluoranthene	4.27	0.030	µg/L	4.36		98	67-133			
Fluorene	4.06	0.050	µg/L	4.40		92	55-122			
Indeno(1,2,3-cd)pyrene	4.08	0.050	µg/L	4.44		92	62-126			
1-Methylnaphthalene	3.95	0.100	µg/L	4.38		90	53-125			
2-Methylnaphthalene	3.82	0.100	µg/L	4.36		88	52-122			
Naphthalene	3.90	0.200	µg/L	4.44		88	50-130			
Phenanthrene	4.29	0.100	µg/L	4.40		97	67-127			
Pyrene	4.30	0.020	µg/L	4.44		97	68-133			
Quinoline	6.02	0.050	µg/L	4.44		136	51-140			
Surrogate: Acridine-d9	*3.07*		*µg/L*	4.44		*69*	*50-140*			
Surrogate: Naphthalene-d8	*3.86*		*µg/L*	4.44		*87*	*50-140*			
Surrogate: Perylene-d12	*4.16*		*µg/L*	4.44		*94*	*50-140*			
LCS Dup (B8D1327-BSD1)				Prepared: 2018-04-19, Analyzed: 2018-04-19						
Acenaphthene	4.34	0.050	µg/L	4.40		99	58-125	6	16	
Acenaphthylene	4.51	0.200	µg/L	4.40		102	54-128	6	16	
Acridine	2.89	0.050	µg/L	4.44		65	50-112	3	26	
Anthracene	4.45	0.010	µg/L	4.44		100	66-125	4	14	
Benz(a)anthracene	4.96	0.010	µg/L	4.44		112	59-123	2	23	
Benzo(a)pyrene	4.74	0.010	µg/L	4.40		108	62-116	3	16	
Benzo(b+j)fluoranthene	9.26	0.050	µg/L	8.89		104	69-121	1	14	
Benzo(g,h,i)perylene	4.25	0.050	µg/L	4.40		97	58-129	4	25	
Benzo(k)fluoranthene	4.83	0.050	µg/L	4.44		109	67-128	4	18	
2-Chloronaphthalene	3.89	0.100	µg/L	4.44		88	50-140	6	30	
Chrysene	4.98	0.050	µg/L	4.42		113	58-125	3	24	
Dibenz(a,h)anthracene	4.30	0.010	µg/L	4.42		97	58-126	4	23	
Fluoranthene	4.41	0.030	µg/L	4.36		101	67-133	3	18	
Fluorene	4.30	0.050	µg/L	4.40		98	55-122	6	16	
Indeno(1,2,3-cd)pyrene	4.21	0.050	µg/L	4.44		95	62-126	3	22	
1-Methylnaphthalene	4.23	0.100	µg/L	4.38		97	53-125	7	16	
2-Methylnaphthalene	4.15	0.100	µg/L	4.36		95	52-122	8	17	
Naphthalene	4.20	0.200	µg/L	4.44		95	50-130	8	18	
Phenanthrene	4.45	0.100	µg/L	4.40		101	67-127	4	14	
Pyrene	4.43	0.020	µg/L	4.44		100	68-133	3	18	
Quinoline	6.18	0.050	µg/L	4.44		139	51-140	3	12	
Surrogate: Acridine-d9	*2.89*		*µg/L*	4.44		*65*	*50-140*			
Surrogate: Naphthalene-d8	*4.14*		*µg/L*	4.44		*93*	*50-140*			
Surrogate: Perylene-d12	*4.30*		*µg/L*	4.44		*97*	*50-140*			

CERTIFICATE OF ANALYSIS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna) 150 - 1715 Dickson Ave. Kelowna, BC V1Y 9G6		
ATTENTION	Chris Chu	**WORK ORDER**	8060739
PO NUMBER		**RECEIVED / TEMP**	2018-06-07 15:48 / 7°C
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11
PROJECT INFO		**COC NUMBER**	B6241

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at jnobrega@caro.ca

Authorized By:

Jessica Nobrega, B.Sc.
Client Service Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11

Analyte	Result	RL	Units	Analyzed	Qualifier
18MW01 (8060739-01) | Matrix: Water | Sampled: 2018-06-06 16:04					
Dissolved Metals					
Copper, dissolved	**0.00459**	0.00040	mg/L	2018-06-14	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-06-14	
Acenaphthylene	< 0.200	0.200	µg/L	2018-06-14	
Acridine	< 0.050	0.050	µg/L	2018-06-14	
Anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Chrysene	< 0.050	0.050	µg/L	2018-06-14	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Fluoranthene	< 0.030	0.030	µg/L	2018-06-14	
Fluorene	< 0.050	0.050	µg/L	2018-06-14	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-06-14	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Naphthalene	< 0.200	0.200	µg/L	2018-06-14	
Phenanthrene	< 0.100	0.100	µg/L	2018-06-14	
Pyrene	< 0.020	0.020	µg/L	2018-06-14	
Quinoline	< 0.050	0.050	µg/L	2018-06-14	
Surrogate: Acridine-d9	*71*	*50-140*	%	*2018-06-14*	
Surrogate: Naphthalene-d8	*90*	*50-140*	%	*2018-06-14*	
Surrogate: Perylene-d12	*77*	*50-140*	%	*2018-06-14*	
18MW02 (8060739-02) | Matrix: Water | Sampled: 2018-06-06 12:02					
Dissolved Metals					
Copper, dissolved	**0.00069**	0.00040	mg/L	2018-06-14	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-06-14	
Acenaphthylene	< 0.200	0.200	µg/L	2018-06-14	
Acridine	< 0.050	0.050	µg/L	2018-06-14	
Anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11

Analyte	Result	RL	Units	Analyzed	Qualifier
18MW02 (8060739-02) | Matrix: Water | Sampled: 2018-06-06 12:02, Continued					
Polycyclic Aromatic Hydrocarbons (PAH), Continued					
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Chrysene	< 0.050	0.050	µg/L	2018-06-14	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Fluoranthene	< 0.030	0.030	µg/L	2018-06-14	
Fluorene	< 0.050	0.050	µg/L	2018-06-14	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-06-14	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Naphthalene	< 0.200	0.200	µg/L	2018-06-14	
Phenanthrene	< 0.100	0.100	µg/L	2018-06-14	
Pyrene	< 0.020	0.020	µg/L	2018-06-14	
Quinoline	< 0.050	0.050	µg/L	2018-06-14	
Surrogate: Acridine-d9	*69*	*50-140*	%	*2018-06-14*	
Surrogate: Naphthalene-d8	*88*	*50-140*	%	*2018-06-14*	
Surrogate: Perylene-d12	*79*	*50-140*	%	*2018-06-14*	
18MW03 (8060739-03) | Matrix: Water | Sampled: 2018-06-06 14:00					
Dissolved Metals					
Copper, dissolved	**0.00099**	0.00040	mg/L	2018-06-14	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-06-14	
Acenaphthylene	< 0.200	0.200	µg/L	2018-06-14	
Acridine	< 0.050	0.050	µg/L	2018-06-14	
Anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Chrysene	< 0.050	0.050	µg/L	2018-06-14	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Fluoranthene	< 0.030	0.030	µg/L	2018-06-14	
Fluorene	< 0.050	0.050	µg/L	2018-06-14	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-06-14	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Naphthalene	< 0.200	0.200	µg/L	2018-06-14	
Phenanthrene	< 0.100	0.100	µg/L	2018-06-14	
Pyrene	< 0.020	0.020	µg/L	2018-06-14	
Quinoline	< 0.050	0.050	µg/L	2018-06-14	

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11

Analyte	Result	RL	Units	Analyzed	Qualifier
18MW03 (8060739-03) | Matrix: Water | Sampled: 2018-06-06 14:00, Continued					
Polycyclic Aromatic Hydrocarbons (PAH), Continued					
Surrogate: Acridine-d9	*74*	*50-140*	%	*2018-06-14*	
Surrogate: Naphthalene-d8	*86*	*50-140*	%	*2018-06-14*	
Surrogate: Perylene-d12	*64*	*50-140*	%	*2018-06-14*	
18MW04 (8060739-04) | Matrix: Water | Sampled: 2018-06-06 15:05					
Dissolved Metals					
Copper, dissolved	**0.00136**	0.00040	mg/L	2018-06-14	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-06-14	
Acenaphthylene	< 0.200	0.200	µg/L	2018-06-14	
Acridine	< 0.050	0.050	µg/L	2018-06-14	
Anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Chrysene	< 0.050	0.050	µg/L	2018-06-14	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Fluoranthene	< 0.030	0.030	µg/L	2018-06-14	
Fluorene	< 0.050	0.050	µg/L	2018-06-14	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-06-14	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Naphthalene	< 0.200	0.200	µg/L	2018-06-14	
Phenanthrene	< 0.100	0.100	µg/L	2018-06-14	
Pyrene	< 0.020	0.020	µg/L	2018-06-14	
Quinoline	< 0.050	0.050	µg/L	2018-06-14	
Surrogate: Acridine-d9	*64*	*50-140*	%	*2018-06-14*	
Surrogate: Naphthalene-d8	*85*	*50-140*	%	*2018-06-14*	
Surrogate: Perylene-d12	*70*	*50-140*	%	*2018-06-14*	
DUP#2 (8060739-05) | Matrix: Water | Sampled: 2018-06-06 16:10					
Dissolved Metals					
Copper, dissolved	**0.00522**	0.00040	mg/L	2018-06-14	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2018-06-14	
Acenaphthylene	< 0.200	0.200	µg/L	2018-06-14	

TEST RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
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Analyte	Result	RL	Units	Analyzed	Qualifier
DUP#2 (8060739-05) | Matrix: Water | Sampled: 2018-06-06 16:10, Continued					
Polycyclic Aromatic Hydrocarbons (PAH), Continued					
Acridine	< 0.050	0.050	µg/L	2018-06-14	
Anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benz(a)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2018-06-14	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2018-06-14	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2018-06-14	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Chrysene	< 0.050	0.050	µg/L	2018-06-14	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2018-06-14	
Fluoranthene	< 0.030	0.030	µg/L	2018-06-14	
Fluorene	< 0.050	0.050	µg/L	2018-06-14	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2018-06-14	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2018-06-14	
Naphthalene	< 0.200	0.200	µg/L	2018-06-14	
Phenanthrene	< 0.100	0.100	µg/L	2018-06-14	
Pyrene	< 0.020	0.020	µg/L	2018-06-14	
Quinoline	< 0.050	0.050	µg/L	2018-06-14	
Surrogate: Acridine-d9	*75*	*50-140*	%	*2018-06-14*	
Surrogate: Naphthalene-d8	*90*	*50-140*	%	*2018-06-14*	
Surrogate: Perylene-d12	*82*	*50-140*	%	*2018-06-14*	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11

Analysis Description	Method Ref.	Technique	Location
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
Polycyclic Aromatic Hydrocarbons in Water	EPA 3511* / EPA 8270D	Hexane MicroExtraction (Base/Neutral) / GC-MSD (SIM)	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
mg/L	Milligrams per litre
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B8F1042										
Blank (B8F1042-BLK1)				Prepared: 2018-06-14, Analyzed: 2018-06-14						
Copper, dissolved	< 0.00040	0.00040	mg/L							
LCS (B8F1042-BS1)				Prepared: 2018-06-14, Analyzed: 2018-06-14						
Copper, dissolved	0.0192	0.00040	mg/L	0.0200		96	80-120			
Duplicate (B8F1042-DUP1)		**Source: 8060739-01**		Prepared: 2018-06-14, Analyzed: 2018-06-14						
Copper, dissolved	0.00452	0.00040	mg/L		0.00459			1	20	
Reference (B8F1042-SRM1)				Prepared: 2018-06-14, Analyzed: 2018-06-14						
Copper, dissolved	0.854	0.00040	mg/L	0.844		101	90-115			
Polycyclic Aromatic Hydrocarbons (PAH), Batch B8F1116										
Blank (B8F1116-BLK1)				Prepared: 2018-06-14, Analyzed: 2018-06-14						
Acenaphthene	< 0.050	0.050	µg/L							
Acenaphthylene	< 0.200	0.200	µg/L							
Acridine	< 0.050	0.050	µg/L							
Anthracene	< 0.010	0.010	µg/L							
Benz(a)anthracene	< 0.010	0.010	µg/L							
Benzo(a)pyrene	< 0.010	0.010	µg/L							
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L							
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L							
Benzo(k)fluoranthene	< 0.050	0.050	µg/L							
2-Chloronaphthalene	< 0.100	0.100	µg/L							
Chrysene	< 0.050	0.050	µg/L							
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L							
Fluoranthene	< 0.030	0.030	µg/L							
Fluorene	< 0.050	0.050	µg/L							
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L							
1-Methylnaphthalene	< 0.100	0.100	µg/L							
2-Methylnaphthalene	< 0.100	0.100	µg/L							
Naphthalene	< 0.200	0.200	µg/L							
Phenanthrene	< 0.100	0.100	µg/L							
Pyrene	< 0.020	0.020	µg/L							
Quinoline	< 0.050	0.050	µg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Polycyclic Aromatic Hydrocarbons (PAH), Batch B8F1116, Continued										
Blank (B8F1116-BLK1), Continued				Prepared: 2018-06-14, Analyzed: 2018-06-14						
Surrogate: Acridine-d9	*3.06*		*µg/L*	4.43		*69*	*50-140*			
Surrogate: Naphthalene-d8	*3.63*		*µg/L*	4.48		*81*	*50-140*			
Surrogate: Perylene-d12	*3.36*		*µg/L*	4.48		*75*	*50-140*			
LCS (B8F1116-BS1)				Prepared: 2018-06-14, Analyzed: 2018-06-14						
Acenaphthene	3.03	0.050	µg/L	4.42		69	58-125			
Acenaphthylene	3.37	0.200	µg/L	4.42		76	54-128			
Acridine	2.97	0.050	µg/L	4.46		66	50-112			
Anthracene	3.21	0.010	µg/L	4.46		72	66-125			
Benz(a)anthracene	3.55	0.010	µg/L	4.46		80	59-123			
Benzo(a)pyrene	2.94	0.010	µg/L	4.42		67	62-116			
Benzo(b+j)fluoranthene	6.08	0.050	µg/L	8.93		68	69-121			SPK1
Benzo(g,h,i)perylene	3.13	0.050	µg/L	4.42		71	58-129			
Benzo(k)fluoranthene	3.04	0.050	µg/L	4.46		68	67-128			
2-Chloronaphthalene	2.88	0.100	µg/L	4.46		65	50-140			
Chrysene	3.34	0.050	µg/L	4.44		75	58-125			
Dibenz(a,h)anthracene	3.28	0.010	µg/L	4.44		74	58-126			
Fluoranthene	4.29	0.030	µg/L	4.38		98	67-133			
Fluorene	3.28	0.050	µg/L	4.42		74	55-122			
Indeno(1,2,3-cd)pyrene	3.14	0.050	µg/L	4.46		70	62-126			
1-Methylnaphthalene	3.36	0.100	µg/L	4.40		76	53-125			
2-Methylnaphthalene	3.35	0.100	µg/L	4.38		77	52-122			
Naphthalene	3.57	0.200	µg/L	4.46		80	50-130			
Phenanthrene	3.52	0.100	µg/L	4.42		80	67-127			
Pyrene	4.22	0.020	µg/L	4.46		95	68-133			
Quinoline	6.08	0.050	µg/L	4.46		136	51-140			
Surrogate: Acridine-d9	*3.35*		*µg/L*	4.46		*75*	*50-140*			
Surrogate: Naphthalene-d8	*4.30*		*µg/L*	4.51		*95*	*50-140*			
Surrogate: Perylene-d12	*3.48*		*µg/L*	4.51		*77*	*50-140*			
LCS Dup (B8F1116-BSD1)				Prepared: 2018-06-14, Analyzed: 2018-06-14						
Acenaphthene	2.90	0.050	µg/L	4.46		65	58-125	4	16	
Acenaphthylene	3.20	0.200	µg/L	4.46		72	54-128	5	16	
Acridine	3.18	0.050	µg/L	4.50		71	50-112	7	26	
Anthracene	3.40	0.010	µg/L	4.50		76	66-125	6	14	
Benz(a)anthracene	3.88	0.010	µg/L	4.50		86	59-123	9	23	
Benzo(a)pyrene	3.18	0.010	µg/L	4.46		71	62-116	8	16	
Benzo(b+j)fluoranthene	6.43	0.050	µg/L	9.00		71	69-121	6	14	
Benzo(g,h,i)perylene	3.44	0.050	µg/L	4.46		77	58-129	9	25	
Benzo(k)fluoranthene	3.29	0.050	µg/L	4.50		73	67-128	8	18	
2-Chloronaphthalene	2.68	0.100	µg/L	4.50		59	50-140	7	30	
Chrysene	3.64	0.050	µg/L	4.48		81	58-125	9	24	
Dibenz(a,h)anthracene	3.57	0.010	µg/L	4.48		80	58-126	8	23	
Fluoranthene	4.68	0.030	µg/L	4.41		106	67-133	9	18	
Fluorene	3.27	0.050	µg/L	4.46		73	55-122	< 1	16	
Indeno(1,2,3-cd)pyrene	3.43	0.050	µg/L	4.50		76	62-126	9	22	
1-Methylnaphthalene	3.05	0.100	µg/L	4.43		69	53-125	9	16	
2-Methylnaphthalene	3.04	0.100	µg/L	4.41		69	52-122	10	17	
Naphthalene	3.19	0.200	µg/L	4.50		71	50-130	11	18	
Phenanthrene	3.68	0.100	µg/L	4.46		82	67-127	4	14	
Pyrene	4.62	0.020	µg/L	4.50		103	68-133	9	18	
Quinoline	5.99	0.050	µg/L	4.50		133	51-140	1	12	
Surrogate: Acridine-d9	*3.52*		*µg/L*	4.50		*78*	*50-140*			
Surrogate: Naphthalene-d8	*3.87*		*µg/L*	4.55		*85*	*50-140*			
Surrogate: Perylene-d12	*3.79*		*µg/L*	4.55		*83*	*50-140*			

APPENDIX 2: QUALITY CONTROL RESULTS

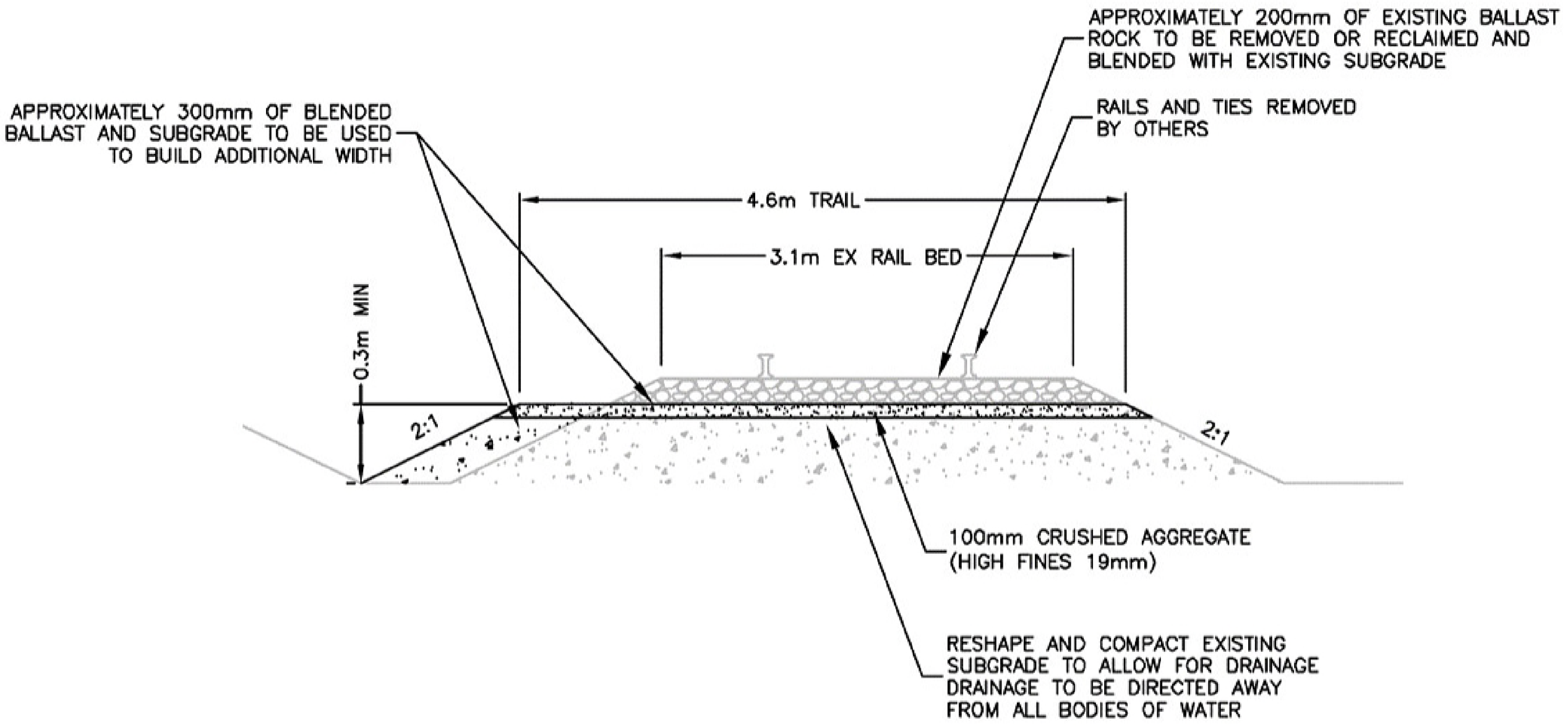
REPORTED TO	Tetra Tech EBA Inc. (Kelowna)	**WORK ORDER**	8060739
PROJECT	704-ENW.VENW03093-02	**REPORTED**	2018-06-15 14:11

QC Qualifiers:

SPK1	The recovery of this analyte was outside of established control limits. The data was accepted based on performance of other batch QC.


OBS WELL 356 - WINFIELD (JIM BAILEY RD.)
1/1/2005
1/1/2010
1/1/2015
Water level below ground surface in metres
2
4
6
8
10

APPENDIX C
PROPOSED RECREATIONAL TRAIL


APPROXIMATELY 200mm OF EXISTING BALLAST
ROCK TO BE REMOVED OR RECLAIMED AND
BLENDED WITH EXISTING SUBGRADE
RAILS AND TIES REMOVED
BY OTHERS
APPROXIMATELY 300mm OF BLENDED
BALLAST AND SUBGRADE TO BE USED
TO BUILD ADDITIONAL WIDTH
4.6m TRAIL
3.1m EX RAIL BED
0.3m MIN
2:1
2:1
100mm CRUSHED AGGREGATE
(HIGH FINES 19mm)
RESHAPE AND COMPACT EXISTING
SUBGRADE TO ALLOW FOR DRAINAGE
DRAINAGE TO BE DIRECTED AWAY
FROM ALL BODIES OF WATER

APPENDIX D
PROUCL OUTPUT

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation			ProUCL 5.16/13/2018 1:57:36 PM								
5	From File			WorkSheet.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	mber of Bootstrap Operations			2000								
9												
10	**BaP**											
11												
12	**General Statistics**											
13	Total Number of Observations					182	Number of Distinct Observations					60
14	Number of Detects					73	Number of Non-Detects					109
15	Number of Distinct Detects					60	Number of Distinct Non-Detects					1
16	Minimum Detect					0.01	Minimum Non-Detect					0.01
17	Maximum Detect					1.3	Maximum Non-Detect					0.01
18	Variance Detects					0.128	Percent Non-Detects					59.89%
19	Mean Detects					0.288	SD Detects					0.358
20	Median Detects					0.11	CV Detects					1.243
21	Skewness Detects					1.57	Kurtosis Detects					1.401
22	Mean of Logged Detects					-2.076	SD of Logged Detects					1.398
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic					0.735	**Normal GOF Test on Detected Observations Only**					
26	5% Shapiro Wilk P Value					0	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.237	**Lilliefors GOF Test**					
28	5% Lilliefors Critical Value					0.104	Detected Data Not Normal at 5% Significance Level					
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	KM Mean					0.122	KM Standard Error of Mean					0.0196
33	KM SD					0.263	95% KM (BCA) UCL					0.157
34	95% KM (t) UCL					0.154	95% KM (Percentile Bootstrap) UCL					0.156
35	95% KM (z) UCL					0.154	95% KM Bootstrap t UCL					0.163
36	90% KM Chebyshev UCL					0.18	95% KM Chebyshev UCL					0.207
37	97.5% KM Chebyshev UCL					0.244	99% KM Chebyshev UCL					0.317
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic					1.423	**Anderson-Darling GOF Test**					
41	5% A-D Critical Value					0.795	Detected Data Not Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.125	**Kolmogorov-Smirnov GOF**					
43	5% K-S Critical Value					0.109	Detected Data Not Gamma Distributed at 5% Significance Level					
44	**Detected Data Not Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)					0.723	k star (bias corrected MLE)					0.703
48	Theta hat (MLE)					0.398	Theta star (bias corrected MLE)					0.41
49	nu hat (MLE)					105.6	nu star (bias corrected)					102.6
50	Mean (detects)					0.288						
51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58	Minimum					0.01	Mean					0.122
59	Maximum					1.3	Median					0.01
60	SD					0.264	CV					2.172
61	k hat (MLE)					0.437	k star (bias corrected MLE)					0.434
62	Theta hat (MLE)					0.278	Theta star (bias corrected MLE)					0.28
63	nu hat (MLE)					159.2	nu star (bias corrected)					157.9
64	Adjusted Level of Significance (β)					0.0487						
65	Approximate Chi Square Value (157.92, α)					129.9	Adjusted Chi Square Value (157.92, β)					129.7

66	95% Gamma Approximate UCL (use when n>=50)					0.148	95% Gamma Adjusted UCL (use when n<50)					0.148
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69	Mean (KM)					0.122	SD (KM)					0.263
70	Variance (KM)					0.0693	SE of Mean (KM)					0.0196
71	k hat (KM)					0.213	k star (KM)					0.213
72	nu hat (KM)					77.56	nu star (KM)					77.62
73	theta hat (KM)					0.57	theta star (KM)					0.57
74	80% gamma percentile (KM)					0.165	90% gamma percentile (KM)					0.367
75	95% gamma percentile (KM)					0.615	99% gamma percentile (KM)					1.292
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78	Approximate Chi Square Value (77.62, α)					58.32	Adjusted Chi Square Value (77.62, β)					58.19
79	5% Gamma Approximate KM-UCL (use when n>=50)					0.162	95% Gamma Adjusted KM-UCL (use when n<50)					0.162
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82	Shapiro Wilk Approximate Test Statistic					0.943	**Shapiro Wilk GOF Test**					
83	5% Shapiro Wilk P Value					0.00451	Detected Data Not Lognormal at 5% Significance Level					
84	Lilliefors Test Statistic					0.0734	**Lilliefors GOF Test**					
85	5% Lilliefors Critical Value					0.104	Detected Data appear Lognormal at 5% Significance Level					
86	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89	Mean in Original Scale					0.119	Mean in Log Scale					-4.462
90	SD in Original Scale					0.265	SD in Log Scale					2.468
91	95% t UCL (assumes normality of ROS data)					0.151	95% Percentile Bootstrap UCL					0.154
92	95% BCA Bootstrap UCL					0.158	95% Bootstrap t UCL					0.156
93	95% H-UCL (Log ROS)					0.484						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96	KM Mean (logged)					-3.591	KM Geo Mean					0.0276
97	KM SD (logged)					1.52	95% Critical H Value (KM-Log)					2.672
98	KM Standard Error of Mean (logged)					0.113	95% H-UCL (KM -Log)					0.118
99	KM SD (logged)					1.52	95% Critical H Value (KM-Log)					2.672
100	KM Standard Error of Mean (logged)					0.113						
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					0.119	Mean in Log Scale					-4.006
105	SD in Original Scale					0.265	SD in Log Scale					1.812
106	95% t UCL (Assumes normality)					0.151	95% H-Stat UCL					0.141
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	KM H-UCL					0.118						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
119												
120	**BbF**											
121												
122	**General Statistics**											
123	Total Number of Observations					182	Number of Distinct Observations					79
124	Number of Detects					85	Number of Non-Detects					97
125	Number of Distinct Detects					79	Number of Distinct Non-Detects					1
126	Minimum Detect					0.01	Minimum Non-Detect					0.01
127	Maximum Detect					2.52	Maximum Non-Detect					0.01
128	Variance Detects					0.322	Percent Non-Detects					53.3%
129	Mean Detects					0.452	SD Detects					0.568
130	Median Detects					0.212	CV Detects					1.255

131	Skewness Detects					1.742	Kurtosis Detects					2.485
132	Mean of Logged Detects					-1.704	SD of Logged Detects					1.537
133												
134	**Normal GOF Test on Detects Only**											
135	Shapiro Wilk Test Statistic					0.754	**Normal GOF Test on Detected Observations Only**					
136	5% Shapiro Wilk P Value					0	Detected Data Not Normal at 5% Significance Level					
137	Lilliefors Test Statistic					0.218	**Lilliefors GOF Test**					
138	5% Lilliefors Critical Value					0.0962	Detected Data Not Normal at 5% Significance Level					
139	**Detected Data Not Normal at 5% Significance Level**											
140												
141	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
142	KM Mean					0.217	KM Standard Error of Mean					0.0331
143	KM SD					0.444	95% KM (BCA) UCL					0.269
144	95% KM (t) UCL					0.271	95% KM (Percentile Bootstrap) UCL					0.272
145	95% KM (z) UCL					0.271	95% KM Bootstrap t UCL					0.281
146	90% KM Chebyshev UCL					0.316	95% KM Chebyshev UCL					0.361
147	97.5% KM Chebyshev UCL					0.424	99% KM Chebyshev UCL					0.546
148												
149	**Gamma GOF Tests on Detected Observations Only**											
150	A-D Test Statistic					0.796	**Anderson-Darling GOF Test**					
151	5% A-D Critical Value					0.802	Detected data appear Gamma Distributed at 5% Significance Leve					
152	K-S Test Statistic					0.073	**Kolmogorov-Smirnov GOF**					
153	5% K-S Critical Value					0.101	Detected data appear Gamma Distributed at 5% Significance Leve					
154	**Detected data appear Gamma Distributed at 5% Significance Level**											
155												
156	**Gamma Statistics on Detected Data Only**											
157	k hat (MLE)					0.668	k star (bias corrected MLE)					0.652
158	Theta hat (MLE)					0.677	Theta star (bias corrected MLE)					0.694
159	nu hat (MLE)					113.5	nu star (bias corrected)					110.9
160	Mean (detects)					0.452						
161												
162	**Gamma ROS Statistics using Imputed Non-Detects**											
163	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
164	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
165	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
166	This is especially true when the sample size is small.											
167	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
168	Minimum					0.01	Mean					0.217
169	Maximum					2.52	Median					0.01
170	SD					0.446	CV					2.057
171	k hat (MLE)					0.385	k star (bias corrected MLE)					0.382
172	Theta hat (MLE)					0.563	Theta star (bias corrected MLE)					0.567
173	nu hat (MLE)					140.1	nu star (bias corrected)					139.1
174	Adjusted Level of Significance (β)					0.0487						
175	Approximate Chi Square Value (139.11, α)					112.9	Adjusted Chi Square Value (139.11, β)					112.7
176	95% Gamma Approximate UCL (use when n>=50)					0.267	95% Gamma Adjusted UCL (use when n<50)					0.267
177												
178	**Estimates of Gamma Parameters using KM Estimates**											
179	Mean (KM)					0.217	SD (KM)					0.444
180	Variance (KM)					0.197	SE of Mean (KM)					0.0331
181	k hat (KM)					0.238	k star (KM)					0.237
182	nu hat (KM)					86.51	nu star (KM)					86.42
183	theta hat (KM)					0.911	theta star (KM)					0.912
184	80% gamma percentile (KM)					0.309	90% gamma percentile (KM)					0.652
185	95% gamma percentile (KM)					1.065	99% gamma percentile (KM)					2.17
186												
187	**Gamma Kaplan-Meier (KM) Statistics**											
188	Approximate Chi Square Value (86.42, α)					65.99	Adjusted Chi Square Value (86.42, β)					65.85
189	5% Gamma Approximate KM-UCL (use when n>=50)					0.284	95% Gamma Adjusted KM-UCL (use when n<50)					0.284
190												
191	**Lognormal GOF Test on Detected Observations Only**											
192	Shapiro Wilk Approximate Test Statistic					0.94	**Shapiro Wilk GOF Test**					
193	5% Shapiro Wilk P Value					0.00106	Detected Data Not Lognormal at 5% Significance Level					
194	Lilliefors Test Statistic					0.0785	**Lilliefors GOF Test**					
195	5% Lilliefors Critical Value					0.0962	Detected Data appear Lognormal at 5% Significance Level					

196	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
197												
198	**Lognormal ROS Statistics Using Imputed Non-Detects**											
199					Mean in Original Scale	0.215			Mean in Log Scale	-3.858		
200					SD in Original Scale	0.446			SD in Log Scale	2.534		
201				95% t UCL (assumes normality of ROS data)		0.27			95% Percentile Bootstrap UCL	0.272		
202					95% BCA Bootstrap UCL	0.282			95% Bootstrap t UCL	0.281		
203					95% H-UCL (Log ROS)	1.08						
204												
205	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
206					KM Mean (logged)	-3.25			KM Geo Mean	0.0388		
207					KM SD (logged)	1.785			95% Critical H Value (KM-Log)	2.963		
208					KM Standard Error of Mean (logged)	0.133			95% H-UCL (KM -Log)	0.282		
209					KM SD (logged)	1.785			95% Critical H Value (KM-Log)	2.963		
210					KM Standard Error of Mean (logged)	0.133						
211												
212	**DL/2 Statistics**											
213	**DL/2 Normal**								**DL/2 Log-Transformed**			
214					Mean in Original Scale	0.214			Mean in Log Scale	-3.62		
215					SD in Original Scale	0.447			SD in Log Scale	2.081		
216					95% t UCL (Assumes normality)	0.269			95% H-Stat UCL	0.389		
217	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
218												
219	**Nonparametric Distribution Free UCL Statistics**											
220	**Detected Data appear Gamma Distributed at 5% Significance Level**											
221												
222	**Suggested UCL to Use**											
223					95% KM Approximate Gamma UCL	0.284						
224												
225	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
226	Recommendations are based upon data size, data distribution, and skewness.											
227	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
228	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
229												
230	**BghiP**											
231												
232	**General Statistics**											
233					Total Number of Observations	182			Number of Distinct Observations	74		
234					Number of Detects	76			Number of Non-Detects	106		
235					Number of Distinct Detects	73			Number of Distinct Non-Detects	2		
236					Minimum Detect	0.021			Minimum Non-Detect	0.02		
237					Maximum Detect	16.2			Maximum Non-Detect	0.021		
238					Variance Detects	8.358			Percent Non-Detects	58.24%		
239					Mean Detects	1.765			SD Detects	2.891		
240					Median Detects	0.572			CV Detects	1.638		
241					Skewness Detects	3.376			Kurtosis Detects	14		
242					Mean of Logged Detects	-0.621			SD of Logged Detects	1.746		
243												
244	**Normal GOF Test on Detects Only**											
245					Shapiro Wilk Test Statistic	0.61			**Normal GOF Test on Detected Observations Only**			
246					5% Shapiro Wilk P Value	0			Detected Data Not Normal at 5% Significance Level			
247					Lilliefors Test Statistic	0.273			**Lilliefors GOF Test**			
248					5% Lilliefors Critical Value	0.102			Detected Data Not Normal at 5% Significance Level			
249	**Detected Data Not Normal at 5% Significance Level**											
250												
251	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
252					KM Mean	0.749			KM Standard Error of Mean	0.153		
253					KM SD	2.046			95% KM (BCA) UCL	1.037		
254					95% KM (t) UCL	1.001			95% KM (Percentile Bootstrap) UCL	1.02		
255					95% KM (z) UCL	1			95% KM Bootstrap t UCL	1.096		
256					90% KM Chebyshev UCL	1.207			95% KM Chebyshev UCL	1.414		
257					97.5% KM Chebyshev UCL	1.702			99% KM Chebyshev UCL	2.268		
258												
259	**Gamma GOF Tests on Detected Observations Only**											
260					A-D Test Statistic	1.058			**Anderson-Darling GOF Test**			

261				5% A-D Critical Value		0.815	Detected Data Not Gamma Distributed at 5% Significance Level					
262				K-S Test Statistic		0.114	**Kolmogorov-Smirnov GOF**					
263				5% K-S Critical Value		0.108	Detected Data Not Gamma Distributed at 5% Significance Level					
264	**Detected Data Not Gamma Distributed at 5% Significance Level**											
265												
266	**Gamma Statistics on Detected Data Only**											
267				k hat (MLE)		0.53	k star (bias corrected MLE)					0.517
268				Theta hat (MLE)		3.334	Theta star (bias corrected MLE)					3.412
269				nu hat (MLE)		80.49	nu star (bias corrected)					78.64
270				Mean (detects)		1.765						
271												
272	**Gamma ROS Statistics using Imputed Non-Detects**											
273	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
274	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
275	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
276	This is especially true when the sample size is small.											
277	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
278				Minimum		0.01	Mean					0.743
279				Maximum		16.2	Median					0.01
280				SD		2.053	CV					2.764
281				k hat (MLE)		0.266	k star (bias corrected MLE)					0.265
282				Theta hat (MLE)		2.794	Theta star (bias corrected MLE)					2.801
283				nu hat (MLE)		96.8	nu star (bias corrected)					96.54
284				Adjusted Level of Significance (β)		0.0487						
285				Approximate Chi Square Value (96.54, α)		74.88	Adjusted Chi Square Value (96.54, β)					74.73
286				95% Gamma Approximate UCL (use when n>=50)		0.958	95% Gamma Adjusted UCL (use when n<50)					0.96
287												
288	**Estimates of Gamma Parameters using KM Estimates**											
289				Mean (KM)		0.749	SD (KM)					2.046
290				Variance (KM)		4.185	SE of Mean (KM)					0.153
291				k hat (KM)		0.134	k star (KM)					0.135
292				nu hat (KM)		48.77	nu star (KM)					49.3
293				theta hat (KM)		5.589	theta star (KM)					5.529
294				80% gamma percentile (KM)		0.745	90% gamma percentile (KM)					2.183
295				95% gamma percentile (KM)		4.198	99% gamma percentile (KM)					10.17
296												
297	**Gamma Kaplan-Meier (KM) Statistics**											
298				Approximate Chi Square Value (49.30, α)		34.18	Adjusted Chi Square Value (49.30, β)					34.08
299	5% Gamma Approximate KM-UCL (use when n>=50)					1.08	95% Gamma Adjusted KM-UCL (use when n<50)					1.083
300												
301	**Lognormal GOF Test on Detected Observations Only**											
302				Shapiro Wilk Approximate Test Statistic		0.947	**Shapiro Wilk GOF Test**					
303				5% Shapiro Wilk P Value		0.00745	Detected Data Not Lognormal at 5% Significance Level					
304				Lilliefors Test Statistic		0.0795	**Lilliefors GOF Test**					
305				5% Lilliefors Critical Value		0.102	Detected Data appear Lognormal at 5% Significance Level					
306	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
307												
308	**Lognormal ROS Statistics Using Imputed Non-Detects**											
309				Mean in Original Scale		0.744	Mean in Log Scale					-3.444
310				SD in Original Scale		2.053	SD in Log Scale					3.013
311				95% t UCL (assumes normality of ROS data)		0.996	95% Percentile Bootstrap UCL					1.007
312				95% BCA Bootstrap UCL		1.082	95% Bootstrap t UCL					1.095
313				95% H-UCL (Log ROS)		8.109						
314												
315	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
316				KM Mean (logged)		-2.538	KM Geo Mean					0.0791
317				KM SD (logged)		1.972	95% Critical H Value (KM-Log)					3.177
318				KM Standard Error of Mean (logged)		0.147	95% H-UCL (KM -Log)					0.881
319				KM SD (logged)		1.972	95% Critical H Value (KM-Log)					3.177
320				KM Standard Error of Mean (logged)		0.147						
321												
322	**DL/2 Statistics**											
323	**DL/2 Normal**						**DL/2 Log-Transformed**					
324				Mean in Original Scale		0.743	Mean in Log Scale					-2.941
325				SD in Original Scale		2.053	SD in Log Scale					2.268

326				95% t UCL (Assumes normality)		0.995				95% H-Stat UCL		1.253
327	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
328												
329	**Nonparametric Distribution Free UCL Statistics**											
330	**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**											
331												
332	**Suggested UCL to Use**											
333				KM H-UCL		0.881						
334												
335	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
336	Recommendations are based upon data size, data distribution, and skewness.											
337	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
338	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
339												
340	**BkF**											
341												
342	**General Statistics**											
343				Total Number of Observations		182				Number of Distinct Observations		66
344				Number of Detects		68				Number of Non-Detects		114
345				Number of Distinct Detects		64				Number of Distinct Non-Detects		2
346				Minimum Detect		0.011				Minimum Non-Detect		0.01
347				Maximum Detect		1.14				Maximum Non-Detect		0.4
348				Variance Detects		0.0658				Percent Non-Detects		62.64%
349				Mean Detects		0.234				SD Detects		0.256
350				Median Detects		0.129				CV Detects		1.097
351				Skewness Detects		1.644				Kurtosis Detects		2.198
352				Mean of Logged Detects		-2.052				SD of Logged Detects		1.172
353												
354	**Normal GOF Test on Detects Only**											
355				Shapiro Wilk Test Statistic		0.783				**Normal GOF Test on Detected Observations Only**		
356				5% Shapiro Wilk P Value		1.543E-13				Detected Data Not Normal at 5% Significance Level		
357				Lilliefors Test Statistic		0.206				**Lilliefors GOF Test**		
358				5% Lilliefors Critical Value		0.107				Detected Data Not Normal at 5% Significance Level		
359	**Detected Data Not Normal at 5% Significance Level**											
360												
361	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
362				KM Mean		0.0938				KM Standard Error of Mean		0.0142
363				KM SD		0.19				95% KM (BCA) UCL		0.119
364				95% KM (t) UCL		0.117				95% KM (Percentile Bootstrap) UCL		0.118
365				95% KM (z) UCL		0.117				95% KM Bootstrap t UCL		0.123
366				90% KM Chebyshev UCL		0.136				95% KM Chebyshev UCL		0.156
367				97.5% KM Chebyshev UCL		0.182				99% KM Chebyshev UCL		0.235
368												
369	**Gamma GOF Tests on Detected Observations Only**											
370				A-D Test Statistic		0.793				**Anderson-Darling GOF Test**		
371				5% A-D Critical Value		0.782				Detected Data Not Gamma Distributed at 5% Significance Level		
372				K-S Test Statistic		0.103				**Kolmogorov-Smirnov GOF**		
373				5% K-S Critical Value		0.111				Detected data appear Gamma Distributed at 5% Significance Leve		
374	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
375												
376	**Gamma Statistics on Detected Data Only**											
377				k hat (MLE)		0.967				k star (bias corrected MLE)		0.934
378				Theta hat (MLE)		0.242				Theta star (bias corrected MLE)		0.25
379				nu hat (MLE)		131.5				nu star (bias corrected)		127.1
380				Mean (detects)		0.234						
381												
382	**Gamma ROS Statistics using Imputed Non-Detects**											
383	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
384	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
385	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
386	This is especially true when the sample size is small.											
387	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
388				Minimum		0.01				Mean		0.0936
389				Maximum		1.14				Median		0.01
390				SD		0.19				CV		2.03

391					k hat (MLE)	0.496			k star (bias corrected MLE)			0.491
392					Theta hat (MLE)	0.189			Theta star (bias corrected MLE)			0.191
393					nu hat (MLE)	180.5			nu star (bias corrected)			178.8
394					Adjusted Level of Significance (β)	0.0487						
395					Approximate Chi Square Value (178.81, α)	148.9			Adjusted Chi Square Value (178.81, β)			148.7
396					95% Gamma Approximate UCL (use when n>=50)	0.112			95% Gamma Adjusted UCL (use when n<50)			0.113
397												
398					**Estimates of Gamma Parameters using KM Estimates**							
399					Mean (KM)	0.0938			SD (KM)			0.19
400					Variance (KM)	0.0359			SE of Mean (KM)			0.0142
401					k hat (KM)	0.245			k star (KM)			0.245
402					nu hat (KM)	89.16			nu star (KM)			89.02
403					theta hat (KM)	0.383			theta star (KM)			0.384
404					80% gamma percentile (KM)	0.135			90% gamma percentile (KM)			0.282
405					95% gamma percentile (KM)	0.457			99% gamma percentile (KM)			0.925
406												
407					**Gamma Kaplan-Meier (KM) Statistics**							
408					Approximate Chi Square Value (89.02, α)	68.27			Adjusted Chi Square Value (89.02, β)			68.12
409	5% Gamma Approximate KM-UCL (use when n>=50)					0.122			95% Gamma Adjusted KM-UCL (use when n<50)			0.123
410												
411					**Lognormal GOF Test on Detected Observations Only**							
412					Shapiro Wilk Approximate Test Statistic	0.965			**Shapiro Wilk GOF Test**			
413					5% Shapiro Wilk P Value	0.152			Detected Data appear Lognormal at 5% Significance Level			
414					Lilliefors Test Statistic	0.0516			**Lilliefors GOF Test**			
415					5% Lilliefors Critical Value	0.107			Detected Data appear Lognormal at 5% Significance Level			
416					**Detected Data appear Lognormal at 5% Significance Level**							
417												
418					**Lognormal ROS Statistics Using Imputed Non-Detects**							
419					Mean in Original Scale	0.0926			Mean in Log Scale			-4.16
420					SD in Original Scale	0.191			SD in Log Scale			2.076
421					95% t UCL (assumes normality of ROS data)	0.116			95% Percentile Bootstrap UCL			0.117
422					95% BCA Bootstrap UCL	0.12			95% Bootstrap t UCL			0.12
423					95% H-UCL (Log ROS)	0.224						
424												
425					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
426					KM Mean (logged)	-3.648			KM Geo Mean			0.0261
427					KM SD (logged)	1.426			95% Critical H Value (KM-Log)			2.574
428					KM Standard Error of Mean (logged)	0.107			95% H-UCL (KM -Log)			0.0946
429					KM SD (logged)	1.426			95% Critical H Value (KM-Log)			2.574
430					KM Standard Error of Mean (logged)	0.107						
431												
432					**DL/2 Statistics**							
433					**DL/2 Normal**				**DL/2 Log-Transformed**			
434					Mean in Original Scale	0.0916			Mean in Log Scale			-4.065
435					SD in Original Scale	0.192			SD in Log Scale			1.736
436					95% t UCL (Assumes normality)	0.115			95% H-Stat UCL			0.113
437					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
438												
439					**Nonparametric Distribution Free UCL Statistics**							
440					**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**							
441												
442					**Suggested UCL to Use**							
443					95% KM Approximate Gamma UCL	0.122						
444												
445					When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test							
446					When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL							
447												
448					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
449					Recommendations are based upon data size, data distribution, and skewness.							
450					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
451	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
452												
453	**Indeno**											
454												
455					**General Statistics**							

456	Total Number of Observations					182	Number of Distinct Observations					67
457	Number of Detects					70	Number of Non-Detects					112
458	Number of Distinct Detects					66	Number of Distinct Non-Detects					2
459	Minimum Detect					0.021	Minimum Non-Detect					0.02
460	Maximum Detect					3.54	Maximum Non-Detect					0.021
461	Variance Detects					0.611	Percent Non-Detects					61.54%
462	Mean Detects					0.64	SD Detects					0.782
463	Median Detects					0.264	CV Detects					1.222
464	Skewness Detects					1.719	Kurtosis Detects					2.675
465	Mean of Logged Detects					-1.271	SD of Logged Detects					1.422
466												
467	**Normal GOF Test on Detects Only**											
468	Shapiro Wilk Test Statistic					0.765	**Normal GOF Test on Detected Observations Only**					
469	5% Shapiro Wilk P Value					3.109E-15	Detected Data Not Normal at 5% Significance Level					
470	Lilliefors Test Statistic					0.219	**Lilliefors GOF Test**					
471	5% Lilliefors Critical Value					0.106	Detected Data Not Normal at 5% Significance Level					
472	**Detected Data Not Normal at 5% Significance Level**											
473												
474	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
475	KM Mean					0.258	KM Standard Error of Mean					0.0424
476	KM SD					0.568	95% KM (BCA) UCL					0.333
477	95% KM (t) UCL					0.329	95% KM (Percentile Bootstrap) UCL					0.33
478	95% KM (z) UCL					0.328	95% KM Bootstrap t UCL					0.345
479	90% KM Chebyshev UCL					0.386	95% KM Chebyshev UCL					0.443
480	97.5% KM Chebyshev UCL					0.523	99% KM Chebyshev UCL					0.68
481												
482	**Gamma GOF Tests on Detected Observations Only**											
483	A-D Test Statistic					0.947	**Anderson-Darling GOF Test**					
484	5% A-D Critical Value					0.795	Detected Data Not Gamma Distributed at 5% Significance Level					
485	K-S Test Statistic					0.11	**Kolmogorov-Smirnov GOF**					
486	5% K-S Critical Value					0.111	)etected data appear Gamma Distributed at 5% Significance Leve					
487	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
488												
489	**Gamma Statistics on Detected Data Only**											
490	k hat (MLE)					0.729	k star (bias corrected MLE)					0.707
491	Theta hat (MLE)					0.878	Theta star (bias corrected MLE)					0.905
492	nu hat (MLE)					102	nu star (bias corrected)					98.96
493	Mean (detects)					0.64						
494												
495	**Gamma ROS Statistics using Imputed Non-Detects**											
496	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
497	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
498	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
499	This is especially true when the sample size is small.											
500	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
501	Minimum					0.01	Mean					0.252
502	Maximum					3.54	Median					0.01
503	SD					0.572	CV					2.268
504	k hat (MLE)					0.346	k star (bias corrected MLE)					0.344
505	Theta hat (MLE)					0.729	Theta star (bias corrected MLE)					0.733
506	nu hat (MLE)					126	nu star (bias corrected)					125.3
507	Adjusted Level of Significance (β)					0.0487						
508	Approximate Chi Square Value (125.28, α)					100.4	Adjusted Chi Square Value (125.28, β)					100.3
509	95% Gamma Approximate UCL (use when n>=50)					0.315	95% Gamma Adjusted UCL (use when n<50)					0.315
510												
511	**Estimates of Gamma Parameters using KM Estimates**											
512	Mean (KM)					0.258	SD (KM)					0.568
513	Variance (KM)					0.323	SE of Mean (KM)					0.0424
514	k hat (KM)					0.207	k star (KM)					0.207
515	nu hat (KM)					75.34	nu star (KM)					75.43
516	theta hat (KM)					1.249	theta star (KM)					1.247
517	80% gamma percentile (KM)					0.347	90% gamma percentile (KM)					0.782
518	95% gamma percentile (KM)					1.319	99% gamma percentile (KM)					2.791
519												
520	**Gamma Kaplan-Meier (KM) Statistics**											

521	Approximate Chi Square Value (75.43, α)					56.42	Adjusted Chi Square Value (75.43, β)					56.29
522	5% Gamma Approximate KM-UCL (use when n>=50)					0.345	95% Gamma Adjusted KM-UCL (use when n<50)					0.346
523												
524	**Lognormal GOF Test on Detected Observations Only**											
525	Shapiro Wilk Approximate Test Statistic					0.945	**Shapiro Wilk GOF Test**					
526	5% Shapiro Wilk P Value					0.00801	Detected Data Not Lognormal at 5% Significance Level					
527	Lilliefors Test Statistic					0.0842	**Lilliefors GOF Test**					
528	5% Lilliefors Critical Value					0.106	Detected Data appear Lognormal at 5% Significance Level					
529	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
530												
531	**Lognormal ROS Statistics Using Imputed Non-Detects**											
532	Mean in Original Scale					0.253	Mean in Log Scale					-3.786
533	SD in Original Scale					0.572	SD in Log Scale					2.524
534	95% t UCL (assumes normality of ROS data)					0.323	95% Percentile Bootstrap UCL					0.33
535	95% BCA Bootstrap UCL					0.335	95% Bootstrap t UCL					0.335
536	95% H-UCL (Log ROS)					1.126						
537												
538	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
539	KM Mean (logged)					-2.896	KM Geo Mean					0.0552
540	KM SD (logged)					1.555	95% Critical H Value (KM-Log)					2.71
541	KM Standard Error of Mean (logged)					0.116	95% H-UCL (KM -Log)					0.253
542	KM SD (logged)					1.555	95% Critical H Value (KM-Log)					2.71
543	KM Standard Error of Mean (logged)					0.116						
544												
545	**DL/2 Statistics**											
546	**DL/2 Normal**						**DL/2 Log-Transformed**					
547	Mean in Original Scale					0.252	Mean in Log Scale					-3.323
548	SD in Original Scale					0.572	SD in Log Scale					1.848
549	95% t UCL (Assumes normality)					0.322	95% H-Stat UCL					0.302
550	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
551												
552	**Nonparametric Distribution Free UCL Statistics**											
553	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
554												
555	**Suggested UCL to Use**											
556	95% KM Approximate Gamma UCL					0.345						
557												
558	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
559	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
560												
561	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
562	Recommendations are based upon data size, data distribution, and skewness.											
563	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
564	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
565												
566	**Naph**											
567												
568	**General Statistics**											
569	Total Number of Observations					182	Number of Distinct Observations					20
570	Number of Detects					36	Number of Non-Detects					146
571	Number of Distinct Detects					20	Number of Distinct Non-Detects					1
572	Minimum Detect					0.01	Minimum Non-Detect					0.01
573	Maximum Detect					0.271	Maximum Non-Detect					0.01
574	Variance Detects					0.00182	Percent Non-Detects					80.22%
575	Mean Detects					0.0317	SD Detects					0.0427
576	Median Detects					0.021	CV Detects					1.346
577	Skewness Detects					5.307	Kurtosis Detects					30.2
578	Mean of Logged Detects					-3.726	SD of Logged Detects					0.608
579												
580	**Normal GOF Test on Detects Only**											
581	Shapiro Wilk Test Statistic					0.393	**Shapiro Wilk GOF Test**					
582	5% Shapiro Wilk Critical Value					0.935	Detected Data Not Normal at 5% Significance Level					
583	Lilliefors Test Statistic					0.313	**Lilliefors GOF Test**					
584	5% Lilliefors Critical Value					0.145	Detected Data Not Normal at 5% Significance Level					
585	**Detected Data Not Normal at 5% Significance Level**											

586												
587	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
588					KM Mean	0.0143			KM Standard Error of Mean			0.00155
589					KM SD	0.0206			95% KM (BCA) UCL			0.0176
590					95% KM (t) UCL	0.0169			95% KM (Percentile Bootstrap) UCL			0.0171
591					95% KM (z) UCL	0.0168			95% KM Bootstrap t UCL			0.0204
592					90% KM Chebyshev UCL	0.0189			95% KM Chebyshev UCL			0.0211
593					97.5% KM Chebyshev UCL	0.024			99% KM Chebyshev UCL			0.0297
594												
595	**Gamma GOF Tests on Detected Observations Only**											
596					A-D Test Statistic	2.62	**Anderson-Darling GOF Test**					
597					5% A-D Critical Value	0.76	Detected Data Not Gamma Distributed at 5% Significance Level					
598					K-S Test Statistic	0.19	**Kolmogorov-Smirnov GOF**					
599					5% K-S Critical Value	0.149	Detected Data Not Gamma Distributed at 5% Significance Level					
600	**Detected Data Not Gamma Distributed at 5% Significance Level**											
601												
602	**Gamma Statistics on Detected Data Only**											
603					k hat (MLE)	1.968			k star (bias corrected MLE)			1.822
604					Theta hat (MLE)	0.0161			Theta star (bias corrected MLE)			0.0174
605					nu hat (MLE)	141.7			nu star (bias corrected)			131.2
606					Mean (detects)	0.0317						
607												
608	**Gamma ROS Statistics using Imputed Non-Detects**											
609	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
610	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
611	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
612	This is especially true when the sample size is small.											
613	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
614					Minimum	0.01			Mean			0.0143
615					Maximum	0.271			Median			0.01
616					SD	0.0207			CV			1.447
617					k hat (MLE)	2.88			k star (bias corrected MLE)			2.837
618					Theta hat (MLE)	0.00496			Theta star (bias corrected MLE)			0.00504
619					nu hat (MLE)	1048			nu star (bias corrected)			1032
620					Adjusted Level of Significance (β)	0.0487						
621					Approximate Chi Square Value (N/A, α)	958.9			Adjusted Chi Square Value (N/A, β)			958.3
622					95% Gamma Approximate UCL (use when n>=50)	0.0154			95% Gamma Adjusted UCL (use when n<50)			0.0154
623												
624	**Estimates of Gamma Parameters using KM Estimates**											
625					Mean (KM)	0.0143			SD (KM)			0.0206
626					Variance (KM)	4.2547E-4			SE of Mean (KM)			0.00155
627					k hat (KM)	0.48			k star (KM)			0.476
628					nu hat (KM)	174.9			nu star (KM)			173.3
629					theta hat (KM)	0.0298			theta star (KM)			0.03
630					80% gamma percentile (KM)	0.0234			90% gamma percentile (KM)			0.0391
631					95% gamma percentile (KM)	0.0559			99% gamma percentile (KM)			0.0974
632												
633	**Gamma Kaplan-Meier (KM) Statistics**											
634					Approximate Chi Square Value (173.32, α)	143.9			Adjusted Chi Square Value (173.32, β)			143.7
635	5% Gamma Approximate KM-UCL (use when n>=50)					0.0172			95% Gamma Adjusted KM-UCL (use when n<50)			0.0172
636												
637	**Lognormal GOF Test on Detected Observations Only**											
638					Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**					
639					5% Shapiro Wilk Critical Value	0.935	Detected Data Not Lognormal at 5% Significance Level					
640					Lilliefors Test Statistic	0.145	**Lilliefors GOF Test**					
641					5% Lilliefors Critical Value	0.145	Detected Data appear Lognormal at 5% Significance Level					
642	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
643												
644	**Lognormal ROS Statistics Using Imputed Non-Detects**											
645					Mean in Original Scale	0.00909			Mean in Log Scale			-5.604
646					SD in Original Scale	0.022			SD in Log Scale			1.33
647					95% t UCL (assumes normality of ROS data)	0.0118			95% Percentile Bootstrap UCL			0.0119
648					95% BCA Bootstrap UCL	0.0141			95% Bootstrap t UCL			0.0147
649					95% H-UCL (Log ROS)	0.0114						
650												

651	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
652					KM Mean (logged)	-4.431				KM Geo Mean	0.0119	
653					KM SD (logged)	0.44				95% Critical H Value (KM-Log)	1.783	
654					KM Standard Error of Mean (logged)	0.0331				95% H-UCL (KM -Log)	0.0139	
655					KM SD (logged)	0.44				95% Critical H Value (KM-Log)	1.783	
656					KM Standard Error of Mean (logged)	0.0331						
657												
658	**DL/2 Statistics**											
659	**DL/2 Normal**						**DL/2 Log-Transformed**					
660					Mean in Original Scale	0.0103				Mean in Log Scale	-4.987	
661					SD in Original Scale	0.0216				SD in Log Scale	0.683	
662					95% t UCL (Assumes normality)	0.0129				95% H-Stat UCL	0.0095	
663	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
664												
665	**Nonparametric Distribution Free UCL Statistics**											
666	**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**											
667												
668	**Suggested UCL to Use**											
669					KM H-UCL	0.0139						
670												
671	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
672	Recommendations are based upon data size, data distribution, and skewness.											
673	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
674	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
675												
676	**Phen**											
677												
678	**General Statistics**											
679					Total Number of Observations	182				Number of Distinct Observations	45	
680					Number of Detects	48				Number of Non-Detects	134	
681					Number of Distinct Detects	43				Number of Distinct Non-Detects	3	
682					Minimum Detect	0.021				Minimum Non-Detect	0.02	
683					Maximum Detect	0.864				Maximum Non-Detect	0.036	
684					Variance Detects	0.021				Percent Non-Detects	73.63%	
685					Mean Detects	0.111				SD Detects	0.145	
686					Median Detects	0.056				CV Detects	1.31	
687					Skewness Detects	3.508				Kurtosis Detects	15.41	
688					Mean of Logged Detects	-2.654				SD of Logged Detects	0.866	
689												
690	**Normal GOF Test on Detects Only**											
691					Shapiro Wilk Test Statistic	0.6	**Shapiro Wilk GOF Test**					
692					5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level					
693					Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**					
694					5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level					
695	**Detected Data Not Normal at 5% Significance Level**											
696												
697	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
698					KM Mean	0.0439				KM Standard Error of Mean	0.00627	
699					KM SD	0.0837				95% KM (BCA) UCL	0.0538	
700					95% KM (t) UCL	0.0543				95% KM (Percentile Bootstrap) UCL	0.0549	
701					95% KM (z) UCL	0.0542				95% KM Bootstrap t UCL	0.0607	
702					90% KM Chebyshev UCL	0.0627				95% KM Chebyshev UCL	0.0712	
703					97.5% KM Chebyshev UCL	0.0831				99% KM Chebyshev UCL	0.106	
704												
705	**Gamma GOF Tests on Detected Observations Only**											
706					A-D Test Statistic	2.576	**Anderson-Darling GOF Test**					
707					5% A-D Critical Value	0.773	Detected Data Not Gamma Distributed at 5% Significance Level					
708					K-S Test Statistic	0.191	**Kolmogorov-Smirnov GOF**					
709					5% K-S Critical Value	0.131	Detected Data Not Gamma Distributed at 5% Significance Level					
710	**Detected Data Not Gamma Distributed at 5% Significance Level**											
711												
712	**Gamma Statistics on Detected Data Only**											
713					k hat (MLE)	1.247				k star (bias corrected MLE)	1.183	
714					Theta hat (MLE)	0.0886				Theta star (bias corrected MLE)	0.0934	
715					nu hat (MLE)	119.7				nu star (bias corrected)	113.6	

716					Mean (detects)	0.111						
717												
718					**Gamma ROS Statistics using Imputed Non-Detects**							
719					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
720					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
721					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
722					This is especially true when the sample size is small.							
723					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
724					Minimum	0.01				Mean	0.0365	
725					Maximum	0.864				Median	0.01	
726					SD	0.0862				CV	2.359	
727					k hat (MLE)	0.765				k star (bias corrected MLE)	0.756	
728					Theta hat (MLE)	0.0477				Theta star (bias corrected MLE)	0.0483	
729					nu hat (MLE)	278.4				nu star (bias corrected)	275.2	
730					Adjusted Level of Significance (β)	0.0487						
731					Approximate Chi Square Value (275.16, α)	237.7				Adjusted Chi Square Value (275.16, β)	237.5	
732					95% Gamma Approximate UCL (use when n>=50)	0.0423				95% Gamma Adjusted UCL (use when n<50)	0.0423	
733												
734					**Estimates of Gamma Parameters using KM Estimates**							
735					Mean (KM)	0.0439				SD (KM)	0.0837	
736					Variance (KM)	0.00701				SE of Mean (KM)	0.00627	
737					k hat (KM)	0.275				k star (KM)	0.274	
738					nu hat (KM)	99.98				nu star (KM)	99.67	
739					theta hat (KM)	0.16				theta star (KM)	0.16	
740					80% gamma percentile (KM)	0.0656				90% gamma percentile (KM)	0.131	
741					95% gamma percentile (KM)	0.207				99% gamma percentile (KM)	0.406	
742												
743					**Gamma Kaplan-Meier (KM) Statistics**							
744					Approximate Chi Square Value (99.67, α)	77.64				Adjusted Chi Square Value (99.67, β)	77.48	
745	5% Gamma Approximate KM-UCL (use when n>=50)					0.0563				95% Gamma Adjusted KM-UCL (use when n<50)	0.0564	
746												
747					**Lognormal GOF Test on Detected Observations Only**							
748					Shapiro Wilk Test Statistic	0.922				**Shapiro Wilk GOF Test**		
749					5% Shapiro Wilk Critical Value	0.947				Detected Data Not Lognormal at 5% Significance Level		
750					Lilliefors Test Statistic	0.134				**Lilliefors GOF Test**		
751					5% Lilliefors Critical Value	0.127				Detected Data Not Lognormal at 5% Significance Level		
752					**Detected Data Not Lognormal at 5% Significance Level**							
753												
754					**Lognormal ROS Statistics Using Imputed Non-Detects**							
755					Mean in Original Scale	0.0336				Mean in Log Scale	-4.916	
756					SD in Original Scale	0.0872				SD in Log Scale	1.808	
757					95% t UCL (assumes normality of ROS data)	0.0443				95% Percentile Bootstrap UCL	0.0449	
758					95% BCA Bootstrap UCL	0.0483				95% Bootstrap t UCL	0.0514	
759					95% H-UCL (Log ROS)	0.0562						
760												
761					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
762					KM Mean (logged)	-3.58				KM Geo Mean	0.0279	
763					KM SD (logged)	0.708				95% Critical H Value (KM-Log)	1.941	
764					KM Standard Error of Mean (logged)	0.053				95% H-UCL (KM -Log)	0.0397	
765					KM SD (logged)	0.708				95% Critical H Value (KM-Log)	1.941	
766					KM Standard Error of Mean (logged)	0.053						
767												
768					**DL/2 Statistics**							
769					**DL/2 Normal**					**DL/2 Log-Transformed**		
770					Mean in Original Scale	0.0366				Mean in Log Scale	-4.087	
771					SD in Original Scale	0.0861				SD in Log Scale	0.968	
772					95% t UCL (Assumes normality)	0.0471				95% H-Stat UCL	0.0313	
773					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
774												
775					**Nonparametric Distribution Free UCL Statistics**							
776					**Data do not follow a Discernible Distribution at 5% Significance Level**							
777												
778					**Suggested UCL to Use**							
779					95% KM (Chebyshev) UCL	0.0712						
780												

	A	B	C	D	E	F	G	H	I	J	K	L
781	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
782	Recommendations are based upon data size, data distribution, and skewness.											
783	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
784	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
785												

UCL Statistics for Uncensored Full Data Sets											
User Selected Options											
Date/Time of Computation	ProUCL 5.16/25/2018 1:29:22 PM										
From File	all metals 2016_2017.xls										
Full Precision	OFF										
Confidence Coefficient	95%										
mber of Bootstrap Operations	2000										
Cu											
General Statistics											
Total Number of Observations	193			Number of Distinct Observations	152						
				Number of Missing Observations	0						
Minimum	6.9			Mean	48.82						
Maximum	239			Median	28.6						
SD	45.69			Std. Error of Mean	3.289						
Coefficient of Variation	0.936			Skewness	1.327						
Normal GOF Test											
Shapiro Wilk Test Statistic	0.8			**Shapiro Wilk GOF Test**							
5% Shapiro Wilk P Value	0			Data Not Normal at 5% Significance Level							
Lilliefors Test Statistic	0.216			**Lilliefors GOF Test**							
5% Lilliefors Critical Value	0.0642			Data Not Normal at 5% Significance Level							
Data Not Normal at 5% Significance Level											
Assuming Normal Distribution											
95% Normal UCL				**95% UCLs (Adjusted for Skewness)**							
95% Student's-t UCL	54.26			95% Adjusted-CLT UCL (Chen-1995)	54.57						
				95% Modified-t UCL (Johnson-1978)	54.31						
Gamma GOF Test											
A-D Test Statistic	6.518			**Anderson-Darling Gamma GOF Test**							
5% A-D Critical Value	0.775			Data Not Gamma Distributed at 5% Significance Level							
K-S Test Statistic	0.135			**Kolmogorov-Smirnov Gamma GOF Test**							
5% K-S Critical Value	0.0669			Data Not Gamma Distributed at 5% Significance Level							
Data Not Gamma Distributed at 5% Significance Level											
Gamma Statistics											
k hat (MLE)	1.355			k star (bias corrected MLE)	1.338						
Theta hat (MLE)	36.03			Theta star (bias corrected MLE)	36.5						
nu hat (MLE)	523.1			nu star (bias corrected)	516.3						
MLE Mean (bias corrected)	48.82			MLE Sd (bias corrected)	42.22						
				Approximate Chi Square Value (0.05)	464.6						
Adjusted Level of Significance	0.0488			Adjusted Chi Square Value	464.2						
Assuming Gamma Distribution											
95% Approximate Gamma UCL (use when n>=50))	54.26			95% Adjusted Gamma UCL (use when n<50)	54.3						
Lognormal GOF Test											
Shapiro Wilk Test Statistic	0.918			**Shapiro Wilk Lognormal GOF Test**							
5% Shapiro Wilk P Value	1.221E-15			Data Not Lognormal at 5% Significance Level							
Lilliefors Test Statistic	0.102			**Lilliefors Lognormal GOF Test**							
5% Lilliefors Critical Value	0.0642			Data Not Lognormal at 5% Significance Level							
Data Not Lognormal at 5% Significance Level											
Lognormal Statistics											
Minimum of Logged Data	1.932			Mean of logged Data	3.476						
Maximum of Logged Data	5.476			SD of logged Data	0.909						
Assuming Lognormal Distribution											
95% H-UCL	56.06			90% Chebyshev (MVUE) UCL	59.97						
95% Chebyshev (MVUE) UCL	65.07			97.5% Chebyshev (MVUE) UCL	72.15						
99% Chebyshev (MVUE) UCL	86.05										

66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	54.23			95% Jackknife UCL	54.26		
72					95% Standard Bootstrap UCL	54.27			95% Bootstrap-t UCL	54.76		
73					95% Hall's Bootstrap UCL	54.58			95% Percentile Bootstrap UCL	54.49		
74					95% BCA Bootstrap UCL	54.5						
75					90% Chebyshev(Mean, Sd) UCL	58.69			95% Chebyshev(Mean, Sd) UCL	63.16		
76					97.5% Chebyshev(Mean, Sd) UCL	69.36			99% Chebyshev(Mean, Sd) UCL	81.54		
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	63.16						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician											
85												

APPENDIX E
TOXICITY ASSESSMENT

APPENDIX F

Toxicity Assessment

The following discussion presents the toxicity of PAHs relative to human health, in accordance with risk assessment guidelines from British Columbia.

D.1 Evaluation of COPC Carcinogenicity

Health Canada, the USEPA, and the International Agency for Research on Cancer (IARC) categorize chemicals as to their carcinogenicity. For each parameter, the regulatory agencies evaluate evidence from human and animal studies, and classify the data in terms of whether the information is adequate to suggest that a chemical is a carcinogen or not. The classifications typically consider whether information is sufficient to classify a substance as a carcinogen, or if there is limited, inadequate, or no data, or if there is evidence of non-carcinogenicity. As new research becomes available, the USEPA, IARC, and Health Canada then adjust their provisional classification based on the results of new studies or other supporting evidence of carcinogenicity. The USEPA, IARC, and Health Canada classification systems based on a weight of evidence are shown in the below table.

Table D-1: Weight of Evidence Classification System for Carcinogenicity

Health Canada	IARC	USEPA	Description
I	1	A	Human carcinogen
II	2A	B B1 B2	Probable human carcinogen Limited human evidence available Inadequate human evidence; sufficient animal evidence
III	2B	C	Possible human carcinogen
IV	3	D	Not classifiable as to human carcinogenicity
V	4	E	Evidence of non-carcinogenicity for humans

Under this paradigm, it is assumed that if a chemical is known or suspected to be a carcinogen in humans or laboratory animals (Health Canada Group I or II), the chemical has the potential to cause cancer at any level of exposure. This is referred to as a non-threshold effect. For chemicals with non-carcinogenic effects (Health Canada Group III, IV, and V), there is a threshold below which no adverse impacts are expected. The below table summarizes the weight-of-evidence carcinogenic classifications for the selected COPCs.

Table D-2: Weight of Evidence Carcinogenic Classification for Human COPCs

COCs	Health Canada	IARC	USEPA
Benzo(a)pyrene	I	1	A- Carcinogenic to humans

The toxicities of all other carcinogenic PAHs are evaluated with respect to benzo(a)pyrene. All of the PAHs retained for the risk assessment are considered potential carcinogens.

D.2 Toxicity Benchmarks

A reference value for a chemical with carcinogenic effects is called a "slope factor" and represents an upper bound estimate of the slope between exposure and occurrence of effect (cancer). The slope factor represents a dose-response relationship, and when multiplied by the estimate exposure does, provides an upper bound estimate of the probability of developing cancer in a chronically exposed population. The slope factor for benzo(a)pyrene is available from Health Canada (2010) while all other PAHs are evaluated with respect to that toxicity. Total potency equivalents (TPE) (CCME 2010) are listed below for the other PAHs, and were used to develop the BaP TPE exposure concentration evaluated here.

Table 4-8. Benzo(a)Pyrene Total Potency Equivalents Evaluation

COPC	Oral Slope Factor (mg/kg-day)$^{-1}$	Dermal Slope Factor (ug/cm^2-day)^1	Inhalation Slope Factor (mg/kg-day)$^{-1}$	Total Potency Equivalents (CCME 2010)	Slope Factor Reference
Benzo(a)pyrene	2.3	3.5	0.137	1	HC 2010
Benzo(b)fluoranthene	0.23	0.35	0.0137	0.1	NA
Benzo(g,h,i)perylene	0.023	0.035	0.00137	0.01	NA
Benzo(k)fluoranthene	0.23	0..35	0.0137	0.1	NA
Indeno(1,2,3-c,d)pyrene	0.23	0.35	0.0137	0.1	NA

REFERENCES:

Canadian Council of Ministers of the Environment (CCME), 2010. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Polycyclic Aromatic Hydrocarbons.

Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada Part II: Health Canada Toxicological Reference Values (TRVs);

APPENDIX F
LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

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If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.