

**PUBLIC WORKS AND  
GOVERNMENT SERVICES CANADA (PWGSC)**

**TECHNICAL SPECIFICATIONS**

**Sainte-Anne-de-Bellevue Canal National Historic Site**



**Project :** Assets Rehabilitation of Sainte-Anne-de-Bellevue Canal  
Zones, 3, 10, 11, 22, 23 and 24 Ste-Anne-de-Bellevue (Québec)

**Date :** 2018-04-16

**PWGSC files:** R.077243.410

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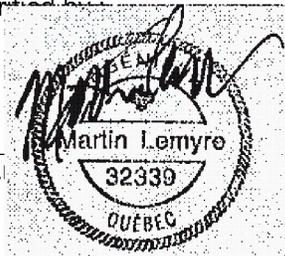
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2018-04-18

<b>Sheet number</b>	<b>Drawing title</b>
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**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises but are not limited to :
  - .1 Assets rehabilitation of upstream (zones 3, 10 et 11) and downstream (zone 22, 23 et 24) of Sainte-Anne-de-Bellevue Canal.
- .2 Specifically, Work of this Contract comprises, but are not limited to, the supply of workforce, materials, equipment and all the operations necessary for :
  - .1 The consolidation of the base of the upstream jetty, marina side (zone 3) by the addition of rip rap;
  - .2 The repair of upstream jetty riverside walls with the addition of a reinforced concrete cover (zones 10 et 11);
  - .3 The repair of zone 22 wall by replacing the end stones and repairing the concreted stone berm;
  - .4 The replacement of existing upstream jetty riverside masonry wall (zone 23) by a precast interlocking concrete block gravity retaining wall sit on a concrete foundation confined in a permanent sheet pile wall with bedrock anchors. Masonry stones must be partially salvaged from the existing wall and stored on site according to section 04 03 43 - Historic - Dismantling Stone requirements;
  - .5 The repair of downstream jetty riverside walls with the addition of a reinforced concrete cover (zones 24);
  - .6 The repair of an embankment with masonry stones.
- .3 Work of the Contract also comprises the following:
  - .1 The construction and/or the implementation of a temporary access (temporary bridge, footbridge, barge, maritime shuttle, etc.) to the work area on the island, as no other access to this area will be available during the Work;
  - .2 The mobilization of equipment and terrestrial and maritime machinery for the execution of the Work;
  - .3 Construction facilities;
  - .4 Environment protection;
  - .5 Maritime signaling;
  - .6 Management of contaminated soils;
  - .7 Restoration of site.

### **1.3 ZONE 22 SPECIFIC FEATURES**

- .1 Contractor must consider that the existing slope protection of zone 22 is damaged and that the stability of the lower stone rows is unknown.
- .2 Prior to undertake Work in zone 22, contractor must:
  - .1 Validate the stability of the lower stone rows of the slope protection by surveying the wooden box and the masonry wall with divers;
  - .2 Provide a report of observations made and appropriate corrective actions and forward to the Departmental Representative for acceptance prior to the work.

### **1.4 ZONE 23 SPECIFIC FEATURES**

- .1 Contractor must consider that the existing wood crib of zone 23 are heavily damaged (partially collapsed, missing wood pieces, numerous openings) which complicate the installation of sheet pile wall.
- .2 Contractor must consider the strong flow in the rapids of Ste-Anne in planning the installation of sheet piling. It is also the Contractor's responsibility to plan and implement safety procedures to protect workers to the risks during the Work (e.g. installation of a flow diverter, etc.)
- .3 Contractor must provide for a temporary cofferdam at the upstream end, as indicated on drawings, and must provide for adequate waterproofing to allow dewatering for forming and concreting of the new wall levelling concrete bed.
- .4 Contractor must confirm the exact position of the North wall deadman anchors with exploratory soundings.
- .5 The sheet pile wall alignment is shown for information purpose only and must be validated by the Contractor prior to the commencement of Work.
- .6 Contractor must consider that the sheet pile wall has to be installed and maintained to the minimum elevation indicated in the drawings, until the complete backfill of the new wall.
- .7 Submit the demolition and reconstruction procedure of zone 23 wall for approval of the Departmental Representative, including, but not limited to:
  - .1 Sequence of construction;
  - .2 Number of planned concrete pours;
  - .3 Sheet piles temporary support;
  - .4 Water management (upstream temporary cofferdams, water management in the jetty, etc.);
  - .5 Excavation limits should consider protection of the root system of trees to be protected;
  - .6 Excavation support and/or erosion control;
  - .7 Engineer confirmation for excavation slope stability.
- .8 Prior to undertake Work in zone 23, contractor must:
  - .1 Validate sheet pile wall alignment (bedrock anchor and sheet piles) with underwater inspection and survey of wood cribs, survey of existing cribs

- and by conducting exploratory soundings to determine the elevation of rock and bottom of cribs;
- .2 Prepare and provide to the Department Representative for approval a final layout of bedrock anchors and sheet pile wall.
- .9 The underwater survey must allow to determine the obstacles to remove or avoid for the sheet pile wall layout.
- .10 The final sheet pile wall layout must be optimized:
- .1 In avoiding conflicts with wood cribs while minimizing encroachment in and watercourse bed;
  - .2 In minimizing axis deviations.
- .11 Prior to the sheet pile end connection to the existing wall, Contractor must:
- .1 Validate the dimensioning metal pieces et adjustment shims with an underwater survey;
  - .2 Prepare a provide to the Department Representative for approval an end connection to the existing wall before start of work.
- .12 Contractor must prepare and provide to the Department Representative a dimensional survey of the existing masonry wall the documents the original construction of the wall. A photographic report must of the existing masonry wall also be provided to the Department Representative.
- .13 Contractor must provide to the Department Representative daily a survey of the sheet pile and rock anchors installation that allows the validation of the layout.
- .14 Contractor must consider the following when planning his water management procedures in zone 23:
- .1 Jetty's high permeability;
  - .2 Important water seepage to be considered;
  - .3 Ensure suspended solids control (refer to 01 35 43 – Environment procedures).

## 1.5 MILESTONES

- .1 The work is to be planned according to the following phases corresponding to different zones:
  - .1 **Phase A:** August 1<sup>st</sup>, 2018 to October 8<sup>th</sup>, 2018.  
The work during this phase is limited to zones 23 and 24. The limits of available zones to the contractor are shown on the phase drawings.
  - .2 **Phase B:** October 9<sup>th</sup>, 2018 to May 18<sup>th</sup>, 2019.  
This phase comprises all work in zones 3, 10, 11, 22, 23 and 24, apart from the sheet pile final level cutting and installation of the capping part, if need be. The work in these zones must be completed by May 18th, 2019 at the latest.
  - .3 **Phase C (optional):** At the earliest, October 15, 2019, for a maximum duration of 20 consecutive days.

This phase is optional and is intended for the possibility that the Contractor cannot finish the finishing work in zone 23 during phase B. The finishing work, such as sheet pile final level cutting and installation of the capping part, shall not affect the commissioning nor the safety of an adequate use of the site.

- .4 The entirety of the Work shall be completed by December 15<sup>th</sup>, 2019.

## **1.6 SEQUENCE OF THE WORK**

- .1 Coordinate the construction progress schedule with the timeframes authorized for each phases of the work.
- .2 Contractor must include a 20 days float in his schedule directly on the critical path of the project, between October 22<sup>nd</sup> and May 4<sup>th</sup>, 2019. This float will allow for potential delays due to additional work resulting from unsuspected site conditions or additional requests from the Department Representative with no effect on the Contractor's schedule. If delays in execution are met, all fees relative to a complexified site organization and to a possible additional mobilisation will be assumed by the Contractor
- .3 Although the sequencing of Work is the Contractor's responsibility, the following steps shall be considered:
  - .1 Construction facilities, terrestrial and maritime mobilisation;
  - .2 Implementation of temporary work such as temporary bridge or other access to the island work area;
  - .3 Utility and equipment temporary displacement and protection;
  - .4 Demolition/ Recovery;
  - .5 Repair and reconstruction of all elements of the Work;
  - .6 Utility and equipment relocation;
  - .7 Cleanup and restoration.
- .4 Site survey: To become familiar with the conditions of the project and to gather all the information necessary to the proper execution of the contract, survey the area of the work. The ignorance of the site conditions will not be considered as a valid argument to justify the claim of additional payment.
- .5 Execute Work in stages to allow the continuous use of site by the public.

## **1.7 CONTRACTOR USE OF PREMISES**

- .1 Contractor must consider that the Work are executed in a historic site. As such, only the authorized areas shall be utilized by the Contractor.
- .2 Other work will be executed during the same period by other contractors on the gate locks as well as on the upstream island area. Contract must abide to the authorized areas according to the work phase indicated on the drawings
- .3 Contractor will have restricted access to Parks Canada boat ramp before November 30<sup>th</sup>, 2018.
- .4 Use of premises is limited to the necessary area for the completion or the work and access in order to:

- .1 Ensure that the work is executed inside Parks Canada property lines and/or the construction site limits, as indicated in the contractual documents.
- .2 At no time will it be allowed to travel or park equipment or any vehicle or store materials on vegetated areas outside the site limits.
- .5 Do not overcharge nor allow to overcharge any part of the work as to avoid compromising its integrity. Respect the authorized loading limits indicated in the drawings, both for the temporary bridge abutment, the travel of equipment and the site storage
- .6 Contractor must find the additional laydown and work area necessary for the execution of Work and is responsible for the associated cost
- .7 Contractor is authorized to install his site trailer in the suggested zones as shown on the drawings, according to the different phase.
- .8 To allow phase A Work to start on August 1<sup>st</sup>, 2018, Contractor is authorized to mobilize from mid-July onwards. To allow this, Contractor must:
  - .1 Find a site near the Work but outside Sainte-Anne-de-Bellevue Canal site for the temporary mobilization of his installation (trailers, tool container, etc.) necessary for the execution of phase A work;
  - .2 Constrain the Work inside the very restrictive site limits shown on the drawings to allow the continuation of the lockage operation in the waterway;
  - .3 Consider that no interference with navigation in the waterway is permitted during lockage hours of operation. The hours of operation are available at this website :  
<http://www.pc.gc.ca/en/lhn-nhs/qc/annedebellevue/visit/heures-hours>
  - .4 Install a site office near the Work site for the Departmental Representative use and for the project meetings, among others.
- .9 During phase B, which is starting October 9th, 2018, Contractor can use the new zones shown on the drawings to reorganize his site service installations (trailers, tool container, etc.) and the temporary mobilization his equipment (concrete pump, crane, etc.). Contractor can therefore, among others, use part of the Park's land leading to the boat ramp located inside the Department's property. This authorization is subject to the following conditions:
  - .1 The stored equipment and material must be positioned at a distance that insures no additional loads is transferred to the upstream wall structure;
  - .2 Ensure the unfettered access to the boat ramp at all times;
  - .3 Ensure the safety of site (fencing, signage, pedestrian link, etc.)
  - .4 Coordinate, if need be, all traffic hindrances on Sainte-Anne street with the City of Sainte-Anne-de-Bellevue;
  - .5 Provide a copy of City's authorizations for all traffic hindrances on Sainte-Anne street;
  - .6 Provide to the Departmental Representative, for approval, a work procedure signed and sealed by an engineer for the work near the upstream wall that certifies its structural integrity;

- .7 Provide a detailed schedule for this work.
- .10 Contractor is authorized to use the boat ramp shown on the drawings for his work. This authorization is conditional to the following requirements:
  - .1 The operations must not damage the ramp's structure
  - .2 Do not monopolize the ramp access and make it accessible to the public and the Owner;
  - .3 Ensure the safety of the site (fencing, signage, pedestrians links, etc.);
  - .4 Provide a ramp usage calendar to the Departmental Representative.
- .11 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

## **1.8 ACCESS ROADS**

- .1 Only the equipment, machinery and vehicles necessary for the execution of work are authorized on the work site. This zone is identified on the drawings. Contractor is responsible for the implementation of the necessary measures to ensure the following
  - .1 Prevent the access of site from the public, in particular the access to the temporary bridge, if need be;
  - .2 Maintain a proper access to the site for the firefighting equipment. Provide for the fire protection equipment as well.
- .2 From August 1<sup>st</sup> to October 2018, Contractor must:
  - .1 Use exclusively craft to access the allowed work site;
  - .2 Ensure free access of the work site secondary access at all times as shown on the drawings.
- .3 Contractor must implement a work procedure that limits to the extent possible the construction vehicles traffic on the public road. The access to the work site will limit to the maximum the environment disturbance.
- .4 Contractor will have to travel over paths with machinery to access the work zone. Contractor will be responsible to repair at his cost the damage on the asphalt, grass, gravel etc., resulting from passage of his equipment.
- .5 Contractor must consider that the walkways located on top of the lock's doors will not be accessible during his work since they are located in another construction zone. The access to these walkways is forbidden at all times.
- .6 From October 22<sup>nd</sup>, 2018, Contractor is authorized to install a temporary bridge in the designated location shown on the drawings. The maximum footprint of the bridge foundation is indicated on the drawings. Dismantling of the bridge must be completed at the latest May 4<sup>th</sup>, 2019.

## **1.9 WORK SCHEDULE**

- .1 Contractor must follow an appropriate work schedule (7AM to 5PM, Monday to Friday, 45 hours per week) to limit the disturbance of residents and public. Contractor must abide to the municipal regulations.

- .2 Work outside of regular hours mentioned at article 1.8.1 which would be necessary to make up for a delay or to accelerate work must be approved beforehand by the Departmental Representative, under the following restrictions:
  - .1 Contractor must obtain beforehand the permits from the City and the authorization from Parks Canada;
  - .2 Additional cost to the Contractor resulting from overtime will be deemed inadmissible;
  - .3 Additional cost for site supervision resulting of Contractor working outside of regular hours will be charged to the Contractor.

#### **1.10 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy of each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Authorization issued by the Fisheries Protection Program of Fisheries and Oceans Canada under the Fisheries Act and the Species at Risk Act;
  - .12 Notice to shipping and Transport Canada approved maritime signage;
  - .13 Other documents as specified.

#### **1.11 WORK PROCEDURE AND ENVIRONMENTAL PROCEDURE**

- .1 In addition to the usual documents, the following documents must be provided at the kick-off meeting:
  - .1 Document describing precisely the work procedures by zones and planned access for the realisation of work in the prescribed schedule;
  - .2 Environmental procedure incorporating all the environmental requirements associated to the work and described in the specifications.

#### **1.12 ENVIRONMENTAL AUTHORIZATIONS**

- .1 The Work of this contract is subjected to an authorization certificate request delivered by the Ministère of Sustainable Development, Environment and the Fight against Climate Change under article 22 of the Environment quality act. The issuance of this certificate is necessary for the start of work in a water environment.

- .2 Regarding the requirements for fish habitat management and protection, no work is to be performed in water environment between April 1<sup>st</sup> and July 31<sup>st</sup>.
  - .1 For all dredging work in zone 3, the installation of turbidity curtain is mandatory.
  - .2 For all work in zone 23 after January 1<sup>st</sup>, 2018, Contractor must provide an Environment protection plan describing the planned measures to avoid the dispersion of sediments with the highest probable water level during work and other environment constraints (temperature, ice, etc.). This plan is subjected to an approval from Fisheries and Oceans Canada. A 3 weeks delay is required by DFO for analysis.
  - .3 Note that a derogation is possible for the use of a barge with spuds and the removal of the temporary bridge regarding the authorized period for work in water environment. Contractor must plan his work according to section 01 35 43 Environmental Procedures.

### **1.13 MANAGEMENT OF CONTAMINATED SOILS**

- .1 Contractor must consider that excavated soils in riverbed, jetty and shore are potentially contaminated and must be subjected to an environmental characterization that establishes their contamination level.
- .2 Besides zone 23, for the work zones that potentially involves excavation, Contractor is responsible of the temporary storage, at his cost, of the excavated material allowing the Department Representative to proceed with their characterization. Plan a 5 business days delay to receive the result. If the material is proven to be contaminated, a ticket system must be implemented to control disposed contaminated soil and water quantity. Otherwise, Contractor must send the material to an authorized disposal site at his cost
- .3 For zone 23, Contractor must consider contaminated soil management for excavated material.
- .4 For zone 23, Contractor is responsible for the preparation of contaminated soils management plan showing contamination polygons and stratigraphy.
- .5 Contractor must refer to section 01 35 13.43 for contaminated soils management specific requirements.

### **1.14 WINTER CONDITION WORK**

- .1 Contractor must include in his tender price all cost incurred for specific work procedure or additional work related probable weather conditions in the project timeframe. These costs include, but are not limited to, snow removal, de-icing, cold weather concreting and earthwork (in accordance with article 7.4.2.5 of CSA A23.1/A23.2), productivity loss and all cost related to winter condition work.

### **1.15 BATHYMETRY AND UNDERWATER CCTV INSPECTION**

- .1 In addition to requirements of section 01 45 00 *Quality control*, Contractor must provide the following bathymetric survey for control purpose:
  - .1 Bathymetric survey of riverbed before and after work, 15m under the footprint of the temporary bridge and all other area used with maritime equipment;

- .2 Bathymetry must be performed with a multibeam sounder. The native file and a processed file with 0.3 meter distance between points must be provided to the Department Representative.
- .2 In addition to the requirements of section 01 45 00 Quality Control, Contractor must perform an underwater CCTV inspection of all work zone at the end of Work to verify the compliance of the work. Each inspection must be provided to the Department Representative immediately for approval of work. At the end of Work, Contractor must provide all inspections in the form of a final report.

#### **1.16 SAINTE-ANNE-DE-BELLEVUE LOCK FEATURES**

- .1 The Sainte-Anne-de-Bellevue lock is operating during the following periods:
  - .1 May 15<sup>th</sup>, 2018 to October 8<sup>th</sup>, 2018;
  - .2 May 16<sup>th</sup>, 2019 au October 14, 2019.
- .2 At all times during the maritime traffic season, a corridor to the lock must be maintained. The corridor must be functional at least 2 weeks prior to the beginning of the season and must be dismantled at the earliest 2 weeks after the end of the season. The waterway must be clear of any major hindrance during the lock hours of operation. (The hours of operation are available at this website: <http://www.pc.gc.ca/en/lhn-nhs/qc/annedebellevue/visit/heures-hours>).

#### **1.17 HARBOUR EQUIPMENT PROTECTION, REMOVAL, RELOCATION**

- .1 All harbour equipment interfering with the work must be identified, surveyed, removed, protected and/or restored and/or relocated, as shown and described in drawings and specifications.

#### **1.18 NAVIGATION CORRIDORS, MARITIME SIGNAGE, AND TRANSPORT CANADA REQUIREMENTS**

- .1 Navigation corridors as shown in drawings must be strictly observed for all work carried out navigation period, which is between May 1<sup>st</sup> and November 1<sup>st</sup>.
- .2 Contractor must submit a maritime signage plan that respect all of Transport Canada's requirements to the Departmental Representative, at least one month before installation of maritime work zones.
- .3 Contractor must especially observe the following requirements:
  - .1 During the navigation season and during all the work, ensure free and safe transit of commercial and pleasure crafts to minimize the impact on navigation;
  - .2 Ensure lighting of the work zones and equipment at night or during reduced visibility conditions;
  - .3 Install at least 6 warning signs that respect Transport Canada navigable waters safety requirements. Signs must be visible at 100m from the work zone. The sign location must be confirmed by Departmental Representative before installation. Warning signs must be as shown below "Location and

specifications of upstream and downstream warning signs”:

### Localisation et spécifications des panneaux d'avertissement en amont et aval des travaux

1. **Installation et orientation:** Les panneaux d'avertissement doivent être positionnés en amont et aval des travaux et être visible à une distance d'au moins 100 mètres à partir de la rivière
2. **Dimensions (min) panneau:** 1300 x 1300 mm (4' x 4').
3. **Dimensions (min) lettrage:** Le lettrage doit avoir au minimum 140 mm de haut.
4. **Couleur et contraste:** Jaune International (Pantone Matching System® – Jaune).
5. **Construction:** Panneaux de couleur Jaune. Bande en périphérie d'une largeur de 100mm de pellicule réfléchissante (Diamond Grade(MC) 3M(MC) ou équivalent) Jaune International (Pantone Matching System®)
6. **Entretien:** Devra être maintenu pendant toute la durée des travaux.



- .4 During all navigation season, mark the work area with yellow buoys, as shown on the drawings. Buoys must be 30 cm tall off water and have a 10 cm wide reflective film strip. Tend buoys at each end of the work area at a 20 meters interval maximum;
- .5 Request the Canadian Coast Guard to issue a Notice to shipping (NOTSHIP) by contacting Marine communications and Traffic Services Center (MCTS) Les Escoumins, by email at [OPSAVIS@dfo-mpo.gc.ca](mailto:OPSAVIS@dfo-mpo.gc.ca), or by fax at 418-233-3299, at least 48 hours before commencing work. Follow-up the NOTSHIP until the end of work;
- .6 Provide the revised drawings with “As built” mention within a 90 days delay following work completion;
- .7 Contractor must provide, if required, Notice of Works form for all temporary work (wharf, sheet pile, platform) that he proposes to install within TC boundaries to achieve his project. Do not install any work before presenting the Notice of Works Form for approval, according to the Navigation Protection Act;
- .8 The marine craft, if used for the realization of the work, and the on-board personnel must abide to Canada Shipping Act, 2001 and all its pursuant regulations and orders;
- .9 Ensure at all times that no equipment, material or debris from the work is abandoned in the watercourse or is causing marine traffic hindrance;
- .10 Put in place buoyage, if necessary, to ensure safe navigation for boater during all work;
- .11 At the end of work, remove all equipment and temporary work and restore the watercourse bed to its original condition;

- .12 At the end of work, Contractor must install 5 warning signs distributed over the length of zone 23 and 24 walls. The location of signs must be validated by the Departmental Representative before installation.
- .13 The warning signs must have the following:
  - .1 Stainless steel panel: 3mm thickness;
  - .2 Sign minimum dimension: 1000 mm x 1000 mm
  - .3 Reflective film:
    - .1 Dimensions: 75 MM, type Diamond;
    - .2 Grade (MC) 3M (MC) or approved equivalent;
    - .3 Color to be determined by Departmental Representative.
  - .4 Text to be determined by Departmental Representative.
- .14 Signs must be anchored to the precast wall with 4 15 mm x 200mm min. stainless steel mechanical anchors.
- .15 At the end of work, Contractor must install 9 buoys along zone 23 and 24. The location of buoys must be validated by the Departmental Representative before installation. Buoys must respect Transport Canada requirements for cautionary keep out buoys.
- .16 All other specificities required by Transport Canada.

#### **1.19 NAVIGATION HINDRANCES**

- .1 Contractor must, precisely and continuously, report all displacement of his marine craft to Marine communications and Traffic Services Center (MCTS) Les Escoumins of the Canadian Coast Guard, by email at [OPSAVIS@dfo-mpo.gc.ca](mailto:OPSAVIS@dfo-mpo.gc.ca), or by fax at 418-233-3299, at least 48 hours
  - .1 Notice to Shipping must be altered according the work;
  - .2 Buoyage must ensure safety, if required.
- 2. Contractor must provide, if required, Notice of Works form for all temporary work (wharf, sheet pile, platform) that he proposes to install within TC boundaries to achieve his project. Do not install any work before presenting the Notice of Works Form for approval, according to the Navigation Protection Act;

#### **1.20 FLOATING EQUIPMENT/MATERIAL**

- .1 Contractor must provide appropriate size equipment for the achievement of work, including excavation, handling, transport and installation of new materials and recovered material mentioned in the contract.
- .2 A certificate of compliance will have to be provided to the Departmental Representative before beginning of work for all floating equipment.
- .3 During execution of the contract, all machinery must be maintained in good working conditions and must be properly and quickly repaired at all times. All equipment used must be seaworthy and in good condition. They must be suitable, by their dimensions, specificities and draught, for the execution of the work.

- .4 Delineate floating material with signal lights in conformity with Canada Shipping Act. Submit a floating material lighting plan to the Departmental Representative for approval under the Navigation Protection Act (NPA).
5. Ensure a radio service on board.
6. Put in place and maintain buoys and signal lighting for all the contract duration.
7. Contractor must supply, install (tender) and maintain, at his cost, all buoys or signaling devices required for the adequate execution of the work. If buoys or devices were to be lost for any circumstances, they must be replaced at the Contractor's cost, at the Departmental Representative's satisfaction. Contractor is responsible for all accidents of any nature, due to a bad buoys/devices layout or visibility, during daytime, or during nighttime due to bad lighting or any other reason.
8. Maintain functional all mandatory beacons and lights installed on floating necessary for the work under the Collision Regulations and the Navigation Safety Regulations. All equipment necessary for the work must be properly identified and visible, at all times.

#### **1.21 VIDEO SURVEY**

- .1 Before undertaking work, Contractor must record a numerical video of all the areas where work will be performed for the purpose of capturing on video the existing conditions before the beginning of the work and to restore the site at the end of the work to its existing condition. Departmental Representative must be present during this survey. Among others, items to capture on video are condition of the roadway, buildings, walls, landscaping, trees, etc.
- .2 A copy of the video (DVD) must be provided to the Departmental Representative.

#### **1.22 HYDROMETRIC STATION DATA AND HYDRAULIC CONDITIONS**

- .1 The data of the hydrometric station located upstream from the Sainte-Anne-de-Bellevue Canal locks are available at:  
<https://www.cehq.gouv.qc.ca/suivihydro/graphique.asp?NoStation=043116>.
- .2 Contractor must interpret maximum and minimum water levels and flow rates in relation to the period of the year, considering that the work area is bordered by rapids and is subject to ice buildup. Contractor must also note that water in zone 3 and under the temporary bridge can freeze across the canal as of December.
- .3 Contractor must consider the water level is affected, among others, by the Rivière des Outaouais Watershed, its numerous tributaries and by the operation of Hydro-Québec dam located upstream. The site is subjected to year-round high floods, but especially during snow melting period, starting in February.
- .4 Contractor must interpret bathymetric data on drawings and available nautical charts and/or produce the necessary survey, if required, to evaluate the available draught in the work area and the seaway leading to it, to plan the mobilization of his marine equipment (barge, boats, etc.)

- .5 No compensation will be granted for difficulties related to a misinterpretation of the available hydraulic information, according to water level as well as ice conditions.

**Part 2 LANDSCAPING WARANTY PERIOD**

**2.1 LANDSCAPING WARANTY PERIOD**

- .1 Contractor must carry out the maintenance of the new lawn, plants or trees installed in the work. Maintenance must commence immediately after the completion of work with reservations and ends 24 months later.

**Part 3 PRODUCTS**

**3.1 NOT USED**

- .1 Not used.

**Part 4 EXECUTION**

**4.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 56 00 – Temporary barriers and enclosures
- .2 01 32 16.07 – Construction progress schedule - Bar (GANTT) chart

**1.2 ACCESS AND EGRESS**

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations. The design of the required elements for on site traffic such as access ramps, or all other elements are under the Contractor's responsibility. Contractor must provide to the Departmental Representative shop drawings signed and sealed from an engineer member of the Ordre des ingénieurs du Québec, for review.
- .2 Site access must be planned by the construction of a temporary bridge when possible and/or with the help of a craft, depending on the working method chosen by the Contractor.
- .3 The location of the temporary bridge is shown on the drawings and cannot be modified.
- .4 It is Contractor's responsibility to manage the access to the water, if required.
- .5 No parking is available for the workers. Contractor must abide by the municipal regulations.
- .6 Contractor must observe the respect the different phases right of ways shown on the drawings.

**1.3 USE OF SITE AND FACILITIES**

- .1 Public access on the jetty is forbidden outside navigation season (phase B). Execute work with least possible interference or disturbance to normal use of premises on North shore, on Sainte-Anne street level. In this regard, make arrangement with Departmental Representative to facilitate work as stated.
- .2 No electrical hook-up to Park Canada's installation is possible. Contractor must provide and plan his own electrical installation.
- .3 Maintain existing services to building and provide for personnel and vehicle access.
- .4 Where security is reduced by work provide temporary means to maintain security.
- .5 Access and use of the lock is forbidden at all times.
- .6 Contractor must observe the respect the different phases right of ways shown on the drawings.
- .7 Provide for Contractor's personnel sanitary facilities and its cleaning.

#### **1.4 EXISTING SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Construct barriers in accordance with section 01 56 00 - Temporary barriers and enclosures.

#### **1.5 SPECIAL REQUIREMENTS**

1. The following articles present special requirements to respect at all times during work :
  - .1 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart:
    - .1 All zones must be shown.
  - .2 Public access to the canal and jetty must be maintained until October 8<sup>th</sup>, 2018.
  - .3 The minimum navigation corridor shown on drawings must be maintain until November 1<sup>st</sup>, 2018. Therefore, no navigation hindrance is permitted between August 1<sup>st</sup> and November 1<sup>st</sup>, 2018.
  - .4 Respect municipal noise regulation.
  - .5 Normal working hours are Monday to Friday for 7AM to 5PM, based on a 45 hours work week. No additional charges cost will be paid for work performed outside normal working hours.
  - .6 No noise generating work is to be carried out Monday to Friday between 8PM and 7AM. Noise generating work consist of, among other, demolition, anchors drilling, rebar, screws and foundation work. Noise generating work also include machinery, mechanical tools and truck traffic. Departmental Representative can prohibit noise generating work outside normal working hours.
  - .7 Upon Contractor's request, it will be possible to work outside normal working hours. An authorization from the Departmental Representative must be provided 72 hours in advance. No additional charges will be paid for work outside normal working hours.
  - .8 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
  - .9 Stay inside the work zones limits and access.
  - .10 Deliver materials outside of peak traffic hours between 9:30AM and 11:30PM and between 13:30PM and 15:00PM unless otherwise approved by Departmental Representative.

- .11 Permitted loads over or near the existing work are indicated on the drawings.
- .2 This list is not comprehensive and Contractor must comply with all specification's requirements.

## **1.6 PRESERVATION OF HISTORICAL/ARCHEOLOGICAL CHARACTER**

- .1 The work zone is considered as an important historical site which contains numerous archeological resources. If an archeological finding happens during work, notify Departmental Representative immediately and wait for written directives before resuming work at the location of the finding.
- .2 During excavation work, an archeologist, appointed and paid by the Departmental Representative, will be on site to establish the potential for possible archeological findings.
- .3 Before starting excavation work, notify the Departmental Representative at least 48 hours in advance to ensure the presence of a Departmental archeologist.
- .4 Contractor must facilitate the archeologist's access to the work site and collaborate for gathering the required information.
- .5 Contractor must plan, at his own cost, a work interruption of 30 minutes per half day of excavation work to allow for archeological survey. These interruptions, are cumulated if unused and could be utilized later, if need be and strictly for the same purpose.
- .6 Contractor must plan 4 extended work stoppage of 4 hours each for the possibility of findings requiring more than 30 minutes, as described previously. The 4 hours period could be used as per the needs and be combined to allow for longer stoppage. Contractor must take these work stoppages into account in his tender as no reclamation will be paid for them.
- .7 If the findings require a work stoppage longer than the time allowed previously, Contractor will have to affect the machinery on other work, in another area of site to allow the archeologists' work continuation. If such a relocation of work is impossible, Contractor will be compensated within the unused interruption time bank. If the time bank is empty, Contractor will be compensated, under the Departmental Representative's approval, for the actual and direct delay and cost caused by this situation (if need be).
- .8 Considering the possibility of finding archeological remains, manual excavation could be required. The presence of archeological remains could also require a slower excavation pace to expose and protect certain type of remains. If this is the case, Contractor will be compensated, under the Departmental Representative's approval, for the actual and direct delay and cost caused by this situation (if need be).
- .9 Remains' protection: Contractor must take all reasonable precautions during excavation work to protect all remains revealed and to expose them for the archeologists' examination. Contractor will be held liable if, by neglect, he deteriorates any findings, and Canada will determine the outcome.
- .10 Prepare a plan that defines the procedures for the identification and protection of historical, archeological, cultural and biological resources of known existence

onsite and/or a plan that defines other procedures to observe in case of a fortuitous discovery of such element on site or its surroundings during the work.

- .11 This plan must include protection methods of known or fortuitous resources and a communication plan between Contractor and Departmental Representative.
- .12 All historical or archeological element discovered on site during excavation work must given to the Departmental Representative.
- .13 In case of fortuitous discovery of cultural resources during the absence of an archeologist, Contractor must cease work immediately in the surrounding of the findings and notify the Departmental Representative.
- .14 If the Departmental Representative authorizes the demolition of archeological elements on site, Contractor must take the necessary precautions to ensure the protection of adjacent archeological elements that are to preserve. Demolition of archeological elements must be performed progressively and in a controlled manner after archeological survey have been completed. If elements are damaged during work, notify Departmental Representative immediately.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 REFERENCES**

- .1 Not used.

### **1.2 SPECIFIC CONDITIONS**

- .1 Sainte-Anne-de-Bellevue Canal Historic Site is recognized by the government of Canada as one having the highest heritage value. As such, on this property, all excavation of soil known to potentially contain archeological remains must be performed under the supervision of an archeologist appointed by the federal government.
- .2 Due to the potential of finding archeological remains during the assets rehabilitation of Sainte-Anne-de-Bellevue Canal (zones 3, 10, 11, 22, 23 and 24) excavation work, this work is subjected to the following section.
- .3 During excavation work, an archeologist, appointed and paid by the Departmental Representative, will be on site to establish the potential for possible archeological findings.
- .4 Before starting excavation work, notify the Departmental Representative at least 48 hours in advance to ensure the presence of a Departmental archeologist.

### **1.3 ACCESS AND COLLABORATION**

- .1 Contractor must cooperate and comply with all instructions given by the project manager during the excavation work to avoid all loss of archeological information, if applicable.
- .2 Contractor must facilitate the archeologist's access to the work site and collaborate. The archeologist or his/her representative will be on site, according to the needs related to the finding's recording and protection. Their role is to guide the Contractor to avoid any archeological information loss and to gather the information on the findings.
- .3 If applicable, Contractor must allow the archeological team to proceed to the examination and archeological survey.
- .4 The archeological team will need time to mobilise. The time and arrangement of the mobilisation will be subjected to prior discussion during the kick off meeting.

### **1.4 ARCHEOLOGICAL FINDINGS**

- .1 Contractor must notify Park Canada representative, or in his absence, the archeologist or his/her representative of all archeological findings on site (construction remains, objects, object fragments, etc.) and wait for instruction before resuming work at the site of the finding.
- .2 The remains, antiques and other elements with any historical, archeological, or scientific value (construction remains, objects, object fragments, etc.) found on the work site or in the demolition or excavation zones remain the property of the Crown. Contractor must protect those elements and obtain instructions from the project manager in this regard.

## **1.5 WORK INTERRUPTION**

- .1 Contractor must plan, at his own cost, a work interruption of 30 minutes per half day of excavation work in the area where archeologist presence is necessary (as described in article 1.6.1 of this section). These interruptions, are cumulated if unused and could be utilized later, if need be. A time log will be held by Park Canada Representative together with the Contractor and the archeologist to account for the unused interruption time.
- .2 Contractor must plan 4 extended work stoppage of 4 hours each for the possibility of findings requiring more than 30 minutes, as described previously. The 4 hours period could be used as per the needs and be combined to allow for longer stoppage. Contractor must take these work stoppages into account in his tender as no reclamation will be paid for them.
- .3 If the findings require a work stoppage longer than the time allowed previously, Contractor will have to affect the machinery on other work, in another area of site to allow the archeologists' work continuation. If such a relocation of work is absolutely impossible, Contractor will be compensated within the unused interruption time bank. If the time bank is empty, Contractor will be compensated, under the Departmental Representative's approval, for the actual and direct delay and cost caused by this situation (if need be).
- .4 In case of fortuitous discovery of cultural resources during the absence of an archeologist, work must cease immediately in the surrounding of the findings and the management unit cultural resources advisor and the Park Canada terrestrial archeology team must be notified in order to protect and preserve the resource.

## **1.6 MANUAL EXCAVATION FOR ARCHEOLOGICAL PURPOSE**

- .1 Considering the possibility of finding archeological remains, contractor is advised that during work, manual excavation and all work necessary to ensure the findings' protection could be required. Contractor will be compensated according to the planned arrangements.
- .2 Considering the possibility of finding archeological remains, manual excavation could be required. The presence of archeological remains could also require a slower excavation pace to expose and protect certain type of remains. If this is the case, Contractor will be compensated, under the Departmental Representative's approval, for the actual and direct delay and cost caused by this situation (if need be).

## **1.7 REMAINS' PROTECTION**

- .1 Remains' protection: Contractor must take all reasonable precautions during excavation work to protect all remains revealed and to expose them for the archeologists' examination. Contractor will be held liable if, by neglect, he deteriorates any findings, and Canada will determine the outcome.
- .2 Prepare a plan that define the procedures for the identification and protection of historical, archeological, cultural and biological resources of known existence onsite and/or a plan that defines other procedures to observe in case of a fortuitous discovery of such element on site or its surroundings during the work.

- .3 This plan must include protection methods of known or fortuitous resources and a communication plan between Contractor and Departmental Representative.
- .4 All historical or archeological element discovered on site during excavation work must given to the Departmental Representative.
- .5 In case of fortuitous discovery of cultural resources during the absence of an archeologist, Contractor must cease work immediately in the surrounding of the findings and notify the Departmental Representative.
- .6 If the Departmental Representative authorizes the demolition of archeological elements on site, Contractor must take the necessary precautions to ensure the protection of adjacent archeological elements that are to preserve. Demolition of archeological elements must be performed progressively and in a controlled manner after archeological survey have been completed. If elements are damaged during work, notify Departmental Representative immediately.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 UNIT PRICE OR LUMP SUM PRICE**

- .1 All work described in this specifications, or presented in the plans, or necessary for the completion of all the work specified herein, but not defined as a separate item requiring a fixed rate or unit payment, will be considered as directly or indirectly linked to the overall purpose of the contract and no separate payment will be made for any of these works; the cost of any work that is directly or indirectly linked to the aim of this contract must however be included in the unit prices quoted in the tender.
- .2 The lump sum price and unit prices will include, but not limited to, leasing, equipment installation, equipment, tools, labour, administrative costs, profit, funding, expenditure for work not specifically defined either in the plan, or specifications or any other tender documents, but considered necessary so as to conform to best practices. It must include losses and damages that may result from the nature of the work, fluctuating wages and salaries, business risks, strikes, delays not attributable to the Consultant, transportation restrictions, accidents and the nature action.
- .3 The Contractor must prepare his tender diligently to ensure that the costs submitted for all the work, with general or specific requirements of the contract, are included in a relevant item on the bid form. No request for additional fees, for the claim of work shown on the plans or described, whose description is not explicitly mentioned in one of the item descriptions of the bid form, will not be admissible.
- .4 The lump sum price and unit prices also include:
  - .1 Testing.
  - .2 Shop drawings stamped and signed by professional engineer registered or licensed in Province of Québec.
  - .3 Conformity attestation stamped and signed by professional engineer registered or licensed in Province of Québec.
  - .4 health and safety measures, protection of the environment such as sediment control and water control.
  - .5 The materials, labor, equipment, protection and special equipment for maritime works.
  - .6 Temporary installations at construction sites.
  - .7 work or extra work related to winter conditions.
  - .8 The supply of materials, including certificates of compliance as well as transportation and handling.
  - .9 Implementation of materials .
  - .10 Diving operations, underwater inspections and bathymetric surveys.
  - .11 Cleaning.

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## **1.2 DEFINITIONS**

- .1 Lump sum works: such jobs will be appraised as a global unit.
- .2 Unit price works: Such work is subjected to a unit price agreement and the quantities indicated in the price list are estimated quantities.

## **1.3 ITEMS DESCRIPTIONS AND TENDER FORM**

The supply of materials, labor, equipment, protection, transportation, administrative costs, profits, financing, etc., necessary to carry out the work of this work, Are included in each of the items described below, unless otherwise indicated.

### **.1 Site organization**

- .1 This item is paid as a lump sum.
- .2 The price quoted in this article must include, but not be limited to :
  - .1 The mobilization and demobilization of construction site, both maritime and land, regardless of the number of mobilization and demobilization required by the phasing of work.
  - .2 The design, supply, installation, maintenance and dismantling of the temporary bridge.
  - .3 The dismantling of guardrails in conflict with the temporary bridge.
  - .4 The removal and disposal of the existing chainlink fence on the pier.
  - .5 The removal and reinstatement of the "Parc Canada" sign at the downstream end of Area 24.
  - .6 Supply, installation, maintenance and dismantling of construction fences.
  - .7 Departmental Representative's Site office.
  - .8 Provide a signaling plan and the implementation of traffic signaling at approaches to the temporary bridge.
  - .9 Marine signs and maintenance of site.
  - .10 Protection of existing utilities including trees and shrubs.
  - .11 Pruning trees to protect on the pier as needed.
  - .12 Snow removal and de-icing if required.
  - .13 Insurance and bond.
  - .14 Costs related to the compliance with any other requirements described in specifications that are not subject to a particular item of the table of amounts.
  - .15 Any incidental expense.
- .3 This item is payable according to the following terms:
  - .1 25 % on the first monthly payment.
  - .2 50 % distributed proportionally to work performed.

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.3 25% to complete demobilization of phase B or C, where applicable.

**.2 Excavation and backfilling**

.1 Zone 3 wall

.1 This item is paid on a unit price basis. Implementation of stones is measured for payment in ton of stone set up in front of the wall as shown in the plans.

.2 The bid price for this item must include, without limiting it to:

.1 The supply and placement of the riprap as shown on the plans.

.2 Any incidental expense.

.3 This article is payable according to the progress of the work.

.2 Zone 11 wall

.1 This item is paid on a lump sum basis for the excavation and filling with granular material and riprap as indicated in plans and as required for the performance of work.

.2 The bid price for this item must include, without limiting it to:

.1 Excavation of the riverbed on wall length to required depth.

.2 Additional costs and delays related to temporary out of site storage necessary for the characterization of materials and other potentially contaminated waste.

.3 Drying and/or containment of water saturated soil in leaktight containers as well as any other dispositions related to handling of potentially contaminated water saturated soils.

.4 Recovery and temporary storage of potentially contaminated waters coming from water saturated materials for characterization.

.5 Disposal of all materials and waste to a MDDELCC approved site

.6 Elimination of stored waters in accordance with current laws and regulations.

.7 Any incidental expense.

.3 After soil characterization, the supplement for the disposal of contaminated materials to a specialized treatment site will be payed at the corresponding item in the bid form.

.4 This item is payable according to the following terms:

.1 50% following the transport of excavated soils to the final disposal site.

.2 50% following the filling.

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- .3 Zone 23 wall
    - .1 This item is paid on a lump sum basis for excavation and backfilling with granular materials behind the existing masonry wall as shown on the plans and as required for the execution of the work.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 The excavation of the soil retained behind the walls.
      - .2 The costs of the stabilization of the excavation walls.
      - .3 Drying and/or containment of water saturated soil in leaktight containers as well as any other dispositions related to handling of potentially contaminated water saturated soils.
      - .4 Disposal of all materials and waste to a MDDELCC approved site
      - .5 Elimination of stored waters in accordance with current laws and regulations.
      - .6 Backfilling directly behind the wall as indicated in the plans and specifications of the prefabricated block wall manufacturer.
      - .7 Backfilling according to the limits indicated on the site and according to the results of the soil characterization. The excavation materials must be prioritise.
      - .8 Any incidental expense.
    - .3 After soil characterization, the supplement for the disposal of contaminated materials to a specialized treatment site will be payed at the corresponding item in the bid form.
    - .4 This item is payable according to the following terms:
      - .1 Proportion of excavation work up to a maximum of 50% of the total quantity.
      - .2 Proportion of backfilling work .
  - .4 Class B borrow material (provisional)
    - .1 This item is paid according to a unit price. Only when existing materials can not be reused as a result of the characterization, Class B borrow material for backfilling of Zone 23 wall excavations is measured for payment per ton.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Costs associated with the provision of granular materials.
      - .2 Any incidental expense.
    - .3 This item is payable following the presentation of the vouchers to the Departmental Representative and the Contractor.
- .3 New concrete wall surface**
- .1 Zone 10 wall

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- .1 This item is paid according to a unit price. The repair with formwork and increased thickness is measured, for payment purposes, per square meter of orthogonal concrete surface in contact with existing concrete, executed according to plans.
  - .2 Payable areas are measured jointly by the Contractor and the Departmental Representative prior to demolition work.
  - .3 The bid price for this item must include, without limiting it to:
    - .1 Kerf.
    - .2 The demolition performed as indicated on the plans.
    - .3 The protection of existing reinforcements to be preserved.
    - .4 High pressure water jet cleaning of existing reinforcements and concrete surfaces to be preserved.
    - .5 Disposal of all materials and waste to a MDDELCC approved site.
    - .6 Drilling holes and cleaning.
    - .7 Cement anchor, anchors and reinforcement.
    - .8 Forms .
    - .9 Concrete, including curing and finishing .
    - .10 Costs associated with cold weather concreting .
    - .11 Any incidental expense.
  - .4 This item is payable for each concrete pour when the formwork is removed.
- .2 Zone 11 wall (including demolition 10 - 50 mm)
- .1 This item is paid according to a unit price. The repair with formwork and increased thickness is measured, for payment purposes, per square meter of orthogonal concrete surface in contact with existing concrete, executed according to plans where the partial demolition depth of the surface concrete is between 10 and 50 mm.
  - .2 Payable areas are measured jointly by the Contractor and the Departmental Representative prior to demolition work.
  - .3 The bid price for this item must include, without limiting it to:
    - .1 Kerf and the demolition of the existing concrete.
    - .2 Disposal of all materials and waste to a MDDELCC approved site.
    - .3 High pressure water jet cleaning of existing reinforcements and concrete surfaces to be preserved.
    - .4 Drilling holes and cleaning.
    - .5 Cement anchor, anchors and reinforcement.
    - .6 Drilling weepholes and cleaning.

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- .7 weepholes including geotextile filled with clean stone .
  - .8 Joints.
  - .9 Forms.
  - .10 Concrete, including curing and finishing .
  - .11 Costs associated with cold weather concreting.
  - .12 Any incidental expense .
  - .4 This item is payable for each concrete pour when the formwork is removed.
  - .3 Zone 11 wall – (including demolition > 50 mm)
    - .1 This item is paid according to a unit price. The repair with formwork and overthickness is measured, for payment purposes, per square meter of orthogonal concrete surface in contact with existing concrete, executed according to plans where the partial demolition depth of the surface concrete is more than 50 mm.
    - .2 Payable areas are measured jointly by the Contractor and the Departmental Representative prior to demolition work.
    - .3 The bid price for this item must include, without limiting it to:
      - .1 Kerf and the demolition of the existing concrete.
      - .2 Disposal of all materials and waste to a MDDELCC approved site.
      - .3 High pressure water jet cleaning of existing reinforcements and concrete surfaces to be preserved.
      - .4 Drilling holes and cleaning.
      - .5 Cement anchor, anchors and reinforcement.
      - .6 Drilling weepholes and cleaning.
      - .7 weepholes including geotextile filled with clean stone .
      - .8 Joints.
      - .9 Formwork.
      - .10 Concrete, including curing and finishing.
      - .11 Costs associated with cold weather concreting.
      - .12 Any incidental expense.
    - .4 This item is payable for each concrete pour when the formwork is removed.
  - .4 Zone 11 wall footing
    - .1 This item is paid according to a unit price . The new concrete footings are measured, for payment purposes, by the cubic meter of concrete placed in the formwork.
    - .2 The bid price for this item must include, without limiting it to

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- .1 Survey the bottom of the existing wall to determine the dimensions of the required footing.
  - .2 Formwork.
  - .3 Concrete, including curing and finishing.
  - .4 Costs associated with cold weather concreting.
  - .5 Any incidental expenses.
  - .3 This item is payable when the formwork is removed.
  - .5 Zone 24 wall
    - .1 This item is paid according to a unit price. The new concrete wall is measured, for payment purposes, in cubic meter of concrete placed in the formwork.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 The stripping of the topsoil.
      - .2 Kerf.
      - .3 The demolition executed as indicated on the plans.
      - .4 The protection of existing reinforcements to be preserved.
      - .5 Excavation of the ground in front of the wall at the level indicated on the plan and backfilling following the work.
      - .6 Additional costs and delays related to temporary out of site storage necessary for the characterization of materials and other potentially contaminated waste.
      - .7 Disposal of all materials and waste to a MDDELCC approved site.
      - .8 High pressure water jet cleaning of existing reinforcements and concrete surfaces to be preserved.
      - .9 Formwork and filling of asperities with existing crib to seal formwork
      - .10 Pullout tests.
      - .11 Drilling holes and cleaning.
      - .12 Supply and installation of galvanized anchors and grout product.
      - .13 Supply and installation of galvanized reinforcement.
      - .14 Field cutting of rebar if required.
      - .15 Concrete, including curing and finishing.
      - .16 Costs associated with cold weather concreting.
      - .17 Any incidental expenses.
    - .3 This item is payable when the formwork is removed.

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.6 Zone 24 wall footing (provisional)

- .1 This item is paid according to a unit price. The new concrete footings are measured, for payment purposes, by the cubic meter of concrete placed in the formwork.
- .2 The bid price for this item must include, without limiting it to:
  - .1 The survey of the bottom of the existing wall to determine the dimensions of the support footing required to support the formwork, if the Contractor deems it necessary.
  - .2 Formwork.
  - .3 Concrete, including curing and finishing.
  - .4 Costs associated with cold weather concreting.
  - .5 Any incidental expenses.
- .3 This item is payable when the formwork is removed.

**.4 Zone 23 retaining wall rehabilitation**

- .1 Final implementation of sheet pile wall.
  - .1 This item is paid on a lump sum.
  - .2 The bid price for this item must include, without limiting it to:
    - .1 Costs associated with the survey of the existing wood crib by divers.
    - .2 Costs associated with the completion of a definitive implementation plan for rock anchorages and sheet piling.
    - .3 The costs associated with the realization of exploratory wells on the pier in order to locate the position of the anchor blocks in the embankment.
    - .4 The mobilization and demobilization of a drill to validate the position of the rock in front of the wooden cribs before the zone 23 wall construction works.
    - .5 Labor, equipment, materials and all incidental expenses.
  - .3 The payment of this item is made according to the progress of the work of this item.
- .2 Exploratory drilling
  - .1 This item is paid according to a unit price. Exploration drilling to validate the rock position in front of the wooden crib is measured, for payment purposes, at the unit. A unit is equal to the complete completion of a borehole.
  - .2 The bid price for this item must include, without limiting it to:
    - .1 Costs associated with the drilling of rock at the site.
    - .2 Any incidental expenses.

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- .3 The payment of this item is made according to the progress of the work of this item.
  - .3 Water Management
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 The costs associated with water management for the dry construction of the bunk bed and the prefabricated retaining wall.
      - .2 The costs associated with the installation of a temporary cofferdam upstream of zone 23 as indicated on the plan.
      - .3 Any incidental expenses.
    - .3 This item is payable in proportion to the progress of work in Area 23.
  - .4 Stone masonry wall deconstruction
    - .1 This item is paid according to a unit price. The deconstruction of the masonry wall is measured, for payment purposes, in cubic meter of stones.
    - .2 The quantities payable are jointly calculated by the Contractor and the Departmental Representative prior to the deconstruction work.
    - .3 The bid price for this item must include, without limiting it to:
      - .1 Labor, equipment, materials, concrete blocks for temporary buttresses (if required), engineering calculations by an engineer-member of the Ordre des ingénieurs du Québec.
      - .2 Costs associated with the deconstruction of the masonry wall.
      - .3 Labor, equipment, materials and any incidental expenses as specified in the relevant sections of the specifications and / or shown on the drawings.
      - .4 Disposal of all materials and waste to a MDDELCC approved site.
      - .5 The costs associated with the completion of a dimensional survey and a photographic report of the existing wall (as indicated in the specifications).
    - .4 The payment is made according to the progress of the work of this item.
  - .5 Demolition of concrete and wooden floor underneath the masonry wall
    - .1 This item is paid according to a unit price . The demolition of concrete or wooden floor underneath the existing masonry wall is measured, for payment purposes, based on cubic meters of in place concrete or in place demolished wood.
    - .2 This article does not concern the demolition of stringers or crossbeams of crib that would conflict with the prefabricated anchor wall.

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- .3 The quantities payable are jointly calculated by the Contractor and the Departmental Representative during the demolition work.
  - .4 The bid price for this item must include, without limiting it to:
    - .1 Complete demolition of the concrete layer underneath the masonry wall
    - .2 Complete demolition of wood floor on existing cribs and under masonry wall.
    - .3 The protection of existing structures to be preserved, including wooden cribs.
    - .4 Associated costs for the transportation of concrete and wood residues in an authorized site.
  - .5 The payment is made according to the progress of the work of this item.
  - .6 Masonry stones recovery extra
    - .1 This item is paid according to a unit price. The extra for recuperation is measured, for payment purposes, per cubic meter of preserved stones identified by the Departmental Representative.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 The costs related to the handling of stones and their protection.
      - .2 The costs associated with the storage of recovered stones, as indicated on the plans.
      - .3 Removal, cleaning and disposal of mortar between existing masonry stones.
      - .4 The costs associated with the numbering of the stones (tag).
      - .5 Costs associated with the supply and installation of a site fence that will remain the property of the Department.
      - .6 Labor, equipment, materials and any incidental expenses.
    - .3 Payment is made in proportion to the progress of the outdoor layout work.
  - .7 Removal of conflictual debris for sheet piling and excavation at the back of the sheet pile.
    - .1 This item is paid according to a unit price. The quantity of the debris in conflict with the sheet pile curtain is measured, for the purpose of payment, by the cubic meter of debris removed from the seabed and disposed according to the volumes measured after excavation and temporary stacking.
    - .2 The bid price for this item must include, without limiting it to :
      - .1 Costs associated with the removal of debris on the seabed in conflict with the placement of sheet piles.
      - .2 Costs associated with leveling the seabed, if required

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- .3 The costs associated with the excavation of the soil, as indicated on the plans, between the wooden crib and the sheet pile wall.
  - .4 Additional costs and delays related to temporary out of site storage necessary for the characterization of materials and other potentially contaminated waste.
  - .5 Additional costs and delays associated with loading, transportation and temporary off-site storage required to characterize materials and other potentially contaminated waste.
  - .6 Drying and/or containment of water saturated soil in leaktight containers as well as any other dispositions related to handling of potentially contaminated water saturated soils.
  - .7 Disposal of all materials and waste to a MDDELCC approved site.
  - .8 All incidental expenses related to removal of debris.
  - .3 After soil characterization, the supplement for the disposal of contaminated materials to a specialized treatment site will be paid at the corresponding item in the bid form.
  - .4 Payment is made based on the quantity of debris removed from the seabed. The quantities must be reconciled at the site between the Departmental Representative and the Contractor, after detailed dimensional survey carried out by the Contractor's divers.
  - .8 Rock Anchors
    - .1 This item is paid according to a unit price. An anchored rock anchor is a unit.
    - .2 The bid price for this item must include, without limiting it to :
      - .1 Supply of metal rods, steel guide tubes welded to the sheet pile, injection pipes, expansive cementitious anchor grout.
      - .2 Precise placement of the drilling position in relation to the planned sheet pile.
      - .3 All materials, machinery and equipment required for the drilling of rock anchors including mobilization and demobilization, land and sea.
      - .4 Drilling and cleaning holes in the rock.
      - .5 Complete injection of anchor holes and guide tubes with cement grout.
      - .6 Any incidental expenses.
    - .3 This item is payable for each anchor drilled and anchored to the rock.
  - .9 Steel sheet pile procurement
    - .1 This item is paid according to a unit price. The supply of sheet piles is paid per square meter of sheet pile, measured along the straight

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- length between the end locks of two consecutive sheet piles and the height of the sheet piles, after final cut at the level indicated on the plan, i.e. the level of the steel cap.
- .2 The bid price for this item must include, without limiting it to:
    - .1 The supply of sheet piles according to the required lengths according to the anticipated level of the rock and the minimum elevation indicated on the plans, including studs, tie rods with plate and nuts.
    - .2 Loading, unloading and storage of sheet piles.
    - .3 Transport of sheet pile profiles to the work site.
    - .4 Any incidental expenses.
  - .3 This item is payable for each sheet pile profile delivered and installed on site.
- .10 Steel sheet pile installation
- .1 This item is paid according to a unit price. A single sheet pile section with a width of at least 723 mm constitutes one unit.
  - .2 The bid price for this item must include, without limiting it to:
    - .1 All equipment and machinery for driving sheet piles to the required depth.
    - .2 The implantation by surveying the axes of the wall.
    - .3 Cutting sheet piles and steel pipes (if required) to reach the final elevations required for the plans.
    - .4 Any incidental expenses.
  - .3 This item is payable according to the following terms:
    - .1 85% of one unit after driving this sheet pile unit
    - .2 15% of one unit following the cutting off of this sheet pile unit
- .11 Temporary support of sheet pile wall
- .1 This item is paid on a lump sum.
  - .2 The bid price for this item must include, without limiting it to:
    - .1 Costs associated with the design and preparation of shop drawings for temporary support, signed by an engineer member of the Ordre des ingénieurs du Québec.
    - .2 All equipment and machinery required for temporary support of sheet piles.
    - .3 Implementation, maintenance and removal of the system.
    - .4 Any incidental expenses.
  - .3 This article is payable in proportion to the progress of the work.

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- .12 sheet pile capping
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Supply and installation of folded steel plates and anchors in concrete, including drilling, and chemical anchoring.
      - .2 Supply and installation of folded steel plates and anchors in concrete, including drilling, and chemical anchoring.
      - .3 Adjustments of the required plates according to axis changes according to the final alignment of the sheet piles.
      - .4 The equipment and labor required to carry out the work.
      - .5 Any incidental expenses.
    - .3 The payment is made in proportion to the progress of the work of setting up the cap piece.
  - .13 Sheet piles connection to existing walls
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 All materials, machinery, equipment and labor required to secure the sheet pile wall at the ends of Zone 23.
      - .2 Leveling and cleaning the seabed, if required.
      - .3 After soil characterization, the supplement for the disposal of contaminated materials to a specialized treatment site will be paid at the corresponding item in the bid form.
      - .4 Measurement of existing structures and preparation of detail drawings prior to fabrication of connection pieces to ensure proper installation of start and end profiles.
      - .5 The supply and implementation of the necessary works to seal before the placement of containment concrete. Without limitation, the Contractor must provide the angles, shims and all necessary hardware.
      - .6 Cutting of sheet piles at the ends of the wall on site and welding of angles according to the detail plan submitted by the Contractor.
      - .7 Any incidental expenses.
    - .3 This article is payable in proportion to the progress of the work. The level of progress is determined by the Departmental Representative.
  - .14 Temporary support of the canal deadman anchor block
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:

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- .1 Costs associated with the design and preparation of shop drawings for temporary support, signed by an engineer member of the Ordre des ingénieurs du Québec.
  - .2 All equipment and machinery required for temporary support of sheet piles.
  - .3 Implementation.
  - .4 Any incidental expenses.
  - .3 This item is payable according to the following terms:
    - .1 80% payable following the installation of the temporary support.
    - .2 20% payable following the dismantling of the temporary support.
  - .15 Existing wooden crib partial demolition
    - .1 This item is paid according to a unit price. The partial demolition of a wooden box is measured, for payment purposes, by the cubic meter of demolished wood.
    - .2 This article concerns the pieces of wood that would be in conflict with the prefabricated anchor wall, but the wood of the decking of the crib is excluded from this article.
    - .3 The quantities must be reconciled at the site. The cubic meter of demolished wood must be measured jointly by the Contractor and the Departmental Representative for payment.
    - .4 The bid price for this item must include, without limiting it to:
      - .1 Costs associated with necessary equipment and labor required for underwater cutting and disposal of waste.
      - .2 Any incidental expenses.
    - .5 This article is payable in proportion to the progress of work.
  - .16 Levelling stone 50 – 100mm
    - .1 This item is paid according to a unit price. The 50-100 mm leveling stone is measured, for payment purposes, per tonne of stone set up to fill the existing caissons and as a base for anchor key and support slab concrete.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Costs associated with the provision and placement of granular materials.
      - .2 Any incidental expenses.
    - .3 This item is payable following the presentation of the transportation vouchers to the Departmental Representative and the Contractor.
  - .17 Precast New Jersey barrier anchor wall
    - .1 This item is paid on a lump sum.

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- .2 The bid price for this item must include, without limiting it to:
    - .1 Costs associated with the supply and installation of prefabricated walls, equipped with an "I-Lock" interlocking system.
    - .2 Costs associated with the supply and installation of asymmetric plates and nuts for anchoring prefabricated walls to tie rods.
    - .3 The implementation of drilling in prefabricated walls for the installation of tie rods.
    - .4 Any incidental expenses.
  - .3 This item is payable in proportion to the progress of the work. The level of progress is determined by the Departmental Representative.
  - .18 Anchor key, slab and confinement concrete
    - .1 This item is paid according to a unit price. The placement of the anchor key concrete, the support slab and the containment is measured, for payment purposes, by the cubic meter of concrete placed in the water between the sheet pile and the existing wooden crib as well as the concrete set up on the 50-100 stone to the New Jersey barrier.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Inspection and sealing of the bottom of the sheet piles using sandbags or other methods deemed appropriate by the Contractor, if required.
      - .2 The costs related to the method of segmentation of containment concrete flows chosen by the Contractor.
      - .3 Expenses related to the installation of a weighted geotextile on the vertical face of the existing caissons.
      - .4 Provision of descriptive sheets of the mixture.
      - .5 The supply of concrete as well as all materials, labor and machinery required for implementation.
      - .6 Any incidental expenses.
    - .3 This item is payable at the volume measured by cement mixer and confirmed by weighing loads at the request of the Departmental Representative.
  - .19 Slab rebar
    - .1 This item is paid according to a unit price. The slab reinforcement is measured, for payment purposes, to the kilogram according to the quantities put in place in the formwork. Linear density is determined by the bar designation given in CSA G30.18 "Carbon Steel Bar for Concrete Reinforcement".
    - .2 The bid price for this item must include, without limiting it to:

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- .1 The costs associated with the supply and installation of reinforcement.
  - .2 The costs associated with the fixing of reinforcement and the installation.
  - .3 Costs associated with bar cutting on site.
  - .4 Any incidental expenses.
  - .3 This item is payable according to the reinforcement quantities placed in the formwork after joint measurement by the Departmental Representative and the Contractor.
- .20 Leveling slab complete with concrete, rebar and anchors
- .1 This item is paid on a lump sum.
  - .2 The bid price for this item must include, without limiting it to:
    - .1 The supply of descriptive sheets of the concrete mix.
    - .2 The supply of concrete as well as all materials, labor and machinery required for implementation.
    - .3 The costs associated with the Contractor's method of segmentation of bedding concrete pours.
    - .4 Cold weather concrete protection if required.
    - .5 Any incidental expenses.
  - .3 This article is payable in proportion to the progress of the work. The level of progress is determined by the Departmental Representative.
- .21 Precast interlocking concrete block gravity retaining wall
- .1 This item is paid on a lump sum.
  - .2 The bid price for this item must include, without limiting it to:
    - .1 Engineering and supply of shop drawings and calculation notes signed and sealed by an engineer.
    - .2 The supply, transport and installation of all materials and equipment necessary for the complete execution of the construction of the wall.
    - .3 All costs related to the labor required for the complete execution of this work.
    - .4 All costs related to the supply of materials and labor required for the filling of hollowed out blocks, if any.
    - .5 All costs related to the supply of the net stone for filling behind the wall as indicated on the plan, including the geotextile.
    - .6 All costs related to the supply and installation of anchor to the support slab, as required and according to the manufacturer.
    - .7 All costs related to additional items requested by wall manufacturer.

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- .8 Any incidental expenses.
  - .3 This article is payable in proportion to the progress of the work. The level of progress is determined by the Departmental Representative.
  - .22 Rip rap protection stone, 500-800 mm
    - .1 This item is paid according to a unit price. The implementation of the stones is measured, for the purpose of payment, per ton.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 The costs associated with the supply and placement of the stone.
      - .2 Costs associated with the demolition of existing cemented stone protection.
      - .3 Costs associated with the supply and installation of steel bars to stabilize the base of the stone protection.
      - .4 Any incidental expenses.
    - .3 This item is payable following the presentation of the vouchers to the Departmental Representative and the Contractor.
  - .5 General work**
    - .1 Zone 22 wall slope protection – without additional stone procurement
      - .1 This item is paid according to a unit price. Embankment repairs to Area 22 are measured for payment per square meter of repaired area (including end stone stabilization).
      - .2 The bid price for this item must include, without limiting it to:
        - .1 Refurbishment of the existing slope protection.
        - .2 The reuse of Zone 22 stones or surplus stones from Area 23, from the size indicated on the plan, to correct the slope protection as indicated on the plans.
        - .3 Reprofilng the existing soil before placing the geotextile for the placement of the stones.
        - .4 Supply and placement of geotextile.
        - .5 Fill joints between stones with concrete.
        - .6 Stabilization and repositioning of masonry retaining wall stones at the end of the wall to ensure levels between rows.
        - .7 The price covers labor, equipment, materials and all incidental expenses.
        - .8 Costs associated with the supply and installation of steel bars to stabilize the base of the stone protection.
      - .3 The payment is made when the rehabilitation works of the slope protection of zone 22 are completely finished.

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- .2 Zone 22 wall
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Restoration of the eastern end of the masonry wall
      - .2 Any incidental expenses.
    - .3 The payment is made when the works on zone 22 wall are finished.
  - .3 Steel Guardrail
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Costs associated with the realization of exploratory wells in order to locate the anchor blocks in the embankment and the final layout of the guardrails.
      - .2 The supply of shop drawings.
      - .3 Supply of galvanized railings and post anchoring system.
      - .4 The supply and implementation of railing paint.
      - .5 The supply of materials and the implementation of sonotubes for anchoring slider poles.
      - .6 The supply of additional standard and vandal nuts, as indicated in the specifications.
      - .7 The price covers labor, equipment, materials and all incidental expenses.
    - .3 This article is payable in proportion to the progress of the work. The level of progress is determined by the Departmental Representative.
  - .4 Landscaping and site restoration
    - .1 This item is paid at a fixed price. Landscaping and site restoration includes topsoil placement and sodding of the areas affected by the work as well as cutting, clearing and planting trees as indicated on the plans. In addition, this article includes the repair of asphalt and concrete when existing structures are damaged by work.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Spreading, leveling, stone removal and removal of woody debris and waste.
      - .2 sodding.
      - .3 Cutting, clearing and planting trees.
      - .4 Correction of paved areas as shown on plans.
      - .5 Any incidental expenses.

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- .3 This item is payable in proportion to the progress of the landscaping and restoration work. The level of progress is determined by the Departmental Representative.
  - .4 The restoration of the site is required at the end of each phase of work.
  - .5 Asphalt removal and disposal
    - .1 This item is paid according to a unit price. Removal of paving and layout is measured, for payment purposes, per square meter of pavement removed from the surface of walking trails.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 Removal and disposal of paving and granular materials as indicated on the plans.
      - .2 The price covers labor, equipment, materials and all incidental expenses
    - .3 Asphalt removal and disposal is payable at the end of the work.
  - .6 Pedestrian trail repair
    - .1 This item is paid according to a unit price. The correction of walking trails is measured for payment per square meter of repaired area.
      - .1 Removal is the disposition of granular materials as indicated on the plans.
      - .2 The supply and implementation of the MG20 basecoat as indicated in the plans and specifications.
      - .3 The price covers labor, equipment, materials and all incidental expenses.
    - .2 The correction of walking trails is payable at the end of the work .
  - .7 Chain-link fence
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:
      - .1 The supply of data sheets and other documents, as indicated in the specifications.
      - .2 Costs associated with the supply of materials and the implementation of sonotubes and / or anchorages.
      - .3 Costs associated with the supply and installation of the fence.
      - .4 Any incidental expenses.
    - .3 This article is payable following the installation of the fence .
  - .8 Permanent maritime signage
    - .1 This item is paid on a lump sum.
    - .2 The bid price for this item must include, without limiting it to:

- .1 The supply of data sheets buoys and panels and other documents, as indicated in the specifications.
- .2 Costs associated with the supply of materials and the establishment of permanent maritime signaling.
- .3 Any incidental expenses.
- .3 This article is payable following maritime signaling work, in proportion to the progress.

**.6 Contaminated soils management**

- .1 Contaminated soils management plan
  - .1 This item is paid on a lump sum.
  - .2 The bid price for this item must include, without limiting it to:
    - .1 Costs related to the preparation of a contaminated soil management plan.
    - .2 Additional costs associated with temporary off-site storage if required for the characterization of potentially contaminated materials and other waste.
    - .3 Additional costs and delays associated with loading, transportation and temporary off-site storage required to characterize materials and other potentially contaminated waste.
  - .2 Extra for contaminated soils disposal (A-B range) (Provisional)
    - .1 This article is applicable for contamination ranges A-B. The bid price is based on the degree and type of contamination and is a supplement for the disposition of contaminated soil versus non-contaminated soil whose costs are included in the various relevant items in the table of amounts.
    - .2 This item is paid according to a unit price. Extra for contaminated soils disposal is measured, for payment purposes, per tonne of contaminated soil conveyed and processed at an appropriate disposal or treatment site.
    - .3 Extra for contaminated soils disposal is paid following the submission of signed transportation vouchers indicating the quantity for each shipment as specified in Section 01 35 13.43 Special Procedure - Contaminated Sites or other relevant section.
  - .3 Extra for contaminated soils disposal (B-C range) (Provisional)
    - .1 This article is applicable for contamination ranges B-C. The bid price is based on the degree and type of contamination and is a supplement for the disposition of contaminated soil versus non-contaminated soil whose costs are included in the various relevant items in the table of amounts.
    - .2 This item is paid according to a unit price. Extra for contaminated soils disposal is measured, for payment purposes, per tonne of

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- contaminated soil conveyed and processed at an appropriate disposal or treatment site.
- .3 Extra for contaminated soils disposal is paid following the submission of signed transportation vouchers indicating the quantity for each shipment as specified in Section 01 35 13.43 Special Procedure - Contaminated Sites or other relevant section.
  - .4 Extra for contaminated soils disposal (> C range) (Provisional)
    - .1 This article is applicable for contamination ranges > C. The bid price is based on the degree and type of contamination and is a supplement for the disposition of contaminated soil versus non-contaminated soil whose costs are included in the various relevant items in the table of amounts.
    - .2 This item is paid according to a unit price. Extra for contaminated soils disposal is measured, for payment purposes, per tonne of contaminated soil conveyed and processed at an appropriate disposal or treatment site.
    - .3 Extra for contaminated soils disposal is paid following the submission of signed transportation vouchers indicating the quantity for each shipment as specified in Section 01 35 13.43 Special Procedure - Contaminated Sites or other relevant section.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not Used.

**1.2 APPOINTMENT AND PAYMENT**

- .1 Departmental Representative will appoint and pay for services of testing laboratory except follows:
  - 1. Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - 2. Inspection and testing performed exclusively for Contractor's convenience.
  - 3. Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  - 4. Mill tests and certificates of compliance.
  - 5. Tests specified to be carried out by Contractor under supervision of Departmental Representative.
  - .6 Additional characterization of zone 23, including borings, must be carried out by the Contractor.
  - .7 The preparation of a contaminated soils management plan for zone 23.
  - .8 Testing is to be carried out by the contractor, under the Departmental Representative's supervision.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

**1.3 CONTRACTOR'S RESPONSIBILITIES**

- .1 Provide labour, equipment and facilities to:
  - .1 Provide access to Work for inspection and testing.
  - .2 Facilitate inspections and tests.
  - .3 Make good Work disturbed by inspection and test.
  - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative 48 hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

- .5 Put in place a weigh ticket system to ensure the quantity control for contaminated material and water.
- .6 Dispose materials in an authorized facility.
- .7 Apart from zone 23, store excavated material temporary to allow characterisation by the Departmental Representative.

**Part 2 PRODUCT**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 32 16.07 – Construction progress schedule – Bar GANTT Chart
- .2 01 33 00 – Submittal procedures
- .3 01 52 00 – Construction facilities
- .4 01 56 00 - Temporary barriers and enclosures
- .5 01 78 00 - Closeout submittals

**1.2 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Provide physical space and make arrangements for meetings.
- .3 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.3 PRECONSTRUCTION MEETING**

- .1 Within 5 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
  - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures. .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .8 Final implantation documents of zone 23 sheet pile curtain.

- .9 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Environmental Clauses and specific requirements.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

#### **1.4 PROGRESS MEETINGS**

- .1 Meetings will be held every two (2) weeks during the work, or more as needed, as designated by the Departmental Representative.
- .2 Project manager, superintendent and foreman are to be in attendance.
- .3 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

#### **Part 2 PRODUCTS**

##### **2.1 NOT USED**

- .1 Not Used.

#### **Part 3 EXECUTION**

##### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 All Sections of Division 1 General Requirements

### **1.2 DEFINITIONS**

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five-days work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or another project element. Usually expressed as workdays or workweeks. Duration in workdays is calculated with the Commission de la construction du Québec (CCQ) official calendar.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

### **1.3 REQUIREMENTS**

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Project schedule must show all activities, the duration for shop drawing emissions, a reasonable delay for approval, material order and deliveries, site services installation, and all other pertinent information related to the project critical path.

- .4 Critical path must be clearly shown on the project schedule. Only work in zone 23 can be on the project critical path. Zone 3, 10, 11, 22 and 24 work must be executed in parallel to zone 23 work and at no times can it affect the project critical path.
- .5 A 20 working days buffer must be clearly indicated inside the project critical path in the project schedule, between October 22<sup>nd</sup>, 2018 and May 4<sup>th</sup>, 2019. The purpose of this buffer is to eliminate possible consequences on the project schedule for delays due to unforeseen events, unsuspected site conditions or additional requests from Departmental Representative. This buffer can not be utilized to cover delays due to adverse weather conditions.
- .6 All modifications to the work related to additional requests from Departmental Representative or unsuspected site conditions must be integrated to the project schedule. Contractor must be diligent in reorganizing the project schedule and avoiding additional delays. If delays are inevitable, Contractor must notify the Departmental Representative immediately and provide an updated project schedule showing the implication on the critical path.
- .7 Divide principal activities and project schedule activities according to the work zone. Zone 23 must be divided in 20 linear meters area maximum to provide a good appreciation of the progression and impact of work sequencing on the schedule.
- .8 Contractor must commence work immediately after providing insurance certificate to the satisfaction of the contracting authority or at the pre- established site mobilization dates.
- .9 Project schedule and Bar chart must consider the work restrictions described in related sections.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within five (5) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

#### **1.5 MILESTONES**

- .1 The project milestones are essential to the contract and must be clearly identified in the project calendar.
- .2 Project schedule must respect the following milestones:
  - .1 Contract award: **May 21<sup>st</sup>, 2018.**
  - .2 Final sheet pile wall alignment validation and sheet pile and rock anchors preliminary layout: **at contract award.**
  - .3 Kick-off meeting: around **June 4<sup>th</sup>, 2018.**
  - .4 Delivery date for preliminary layout (issued for comments) and sheet pile shop drawings and installation procedure: **at the kick-off-meeting.**
  - .5 Final layout (issued for construction) delivery date: **August 24<sup>th</sup>, 2018 at the latest.**

.6 Provisional acceptance of work: **May 18<sup>th</sup>, 2019** for all work except sheet pile final cut and capping in zone 23, if need be.

.7 Final acceptance of work: **November 22<sup>nd</sup>, 2019**, after sheet pile final cut and capping in zone 23.

Environmental authorization and other constraints:

- Work in watercourse authorized period: **August 1<sup>st</sup> through March 31<sup>st</sup>**.
- No navigation hindrances in navigation corridor during canal opening hours: May 20<sup>th</sup>, 2018 through October 8<sup>th</sup>, 2018 and May 19<sup>th</sup>, 2019 through October 14<sup>th</sup>, 2019.
- Possible Spring flood period: mid February to end of June (refer to hydrometric station date).

WORK PHASE A (AUGUST 1<sup>ST</sup> TO OCTOBER 8<sup>TH</sup>, 2018):

.3 Work of phase A, in zone 23, consist of, minimally and non-exhaustively, the following:

- .1 Maritime signage installation;
- .2 Exploratory drilling and prior underwater survey;
- .3 Rock anchors drilling;
- .4 Sheet pile installation;
- .5 Temporary sheet pile support installation;
- .6 Existing masonry wall deconstruction;

.4 No work in zones 3, 10, 11 et 22 is allowed in phase A.

.5 Work of phase A must consider the following milestones:

- .1 Authorization to start work: **August 1<sup>st</sup>, 2018**.
- .2 Start of watercourse bed preparation for sheet pile installation: **August 1<sup>st</sup>, 2018** at the earliest and **August 10<sup>th</sup>, 2018** at the latest.
- .3 Start of anchor drilling work and sheet pile installation: **August 1<sup>st</sup>, 2018** at the earliest and **August 17<sup>th</sup>, 2018** at the latest
- .4 Temporary sheet pile support must be installed as soon as the sheet piles are installed.

.6 Work of phase A must consider the following milestones:

- .1 33% completion of anchor drilling and sheet pile installation: **August 31<sup>st</sup>, 2018** at the latest.
- .2 66% completion of anchor drilling and sheet pile installation: **September 14<sup>th</sup>, 2018** at the latest.

WORK PHASE B (OCTOBER 9<sup>TH</sup>, 2018 TO MAY 18<sup>TH</sup>, 2019):

- .7 Work of phase B consists of the complete execution of work in zone 3, 10, 11, 22, 23 and 24 except final sheet pile cut and capping of wall 23, if need be.
- .8 Work of phase B must consider the following milestones:
  - .1 Maritime signage modification starting **November 2<sup>nd</sup>, 2018**.
  - .2 Temporary bridge installation starting **October 22<sup>nd</sup>, 2018**.
  - .3 Beginning of zone 10 and 11 demolition work: **October 29<sup>th</sup>, 2018** at the latest.
  - .4 Beginning of watercourse bed excavation of zone 3: **November 5<sup>th</sup>, 2018** at the latest.
  - .5 Beginning of zone 24 demolition work: **November 12<sup>th</sup>, 2018**, at the latest.
  - .6 Completion of zone 3 work: **November 30<sup>th</sup>, 2018**.
  - .7 Completion of zones 10 and 11: **January 11<sup>th</sup>, 2019**.
  - .8 Completion of zone 23 wall reconstruction, except sheet pile final cut and capping: **February 22<sup>nd</sup>, 2019**.
  - .9 Sheet pile final cut and capping in zone 23 can be done in phase C, at Fall 2019 if necessary.
  - .10 Work in zone 24 must be completed by **February 1<sup>st</sup>, 2019**.
  - .11 Zone 22 slope protection rehabilitation work must be completed by **November 30<sup>th</sup>, 2018**.
  - .12 Planting work must start **May 1<sup>st</sup>, 2019** at the earliest.
  - .13 Temporary bridge dismantling must be completed **May 4<sup>th</sup>, 2019** at the latest.
  - .14 Site demobilization and restoration must be completed by **May 18<sup>th</sup>, 2019**.
- .9 Work of phase B must consider the following milestones:
  - .1 33% completion of concrete footing: **November 23<sup>rd</sup>, 2018** at the latest.
  - .2 66% completion of precast interlock concrete blocks gravity wall construction: **February 1<sup>st</sup>, 2019**.

WORK PHASE C (OCTOBER 2019 TO NOVEMBER 2019):

- .10 Work of phase C consist of the sheet pile final cut and capping installation, if this work could not be completed in phase B.
- .11 Contractor has **20 work days** starting **October 2019** or when the water level will allow it, in conformity with the environmental authorizations, to proceed to the sheet pile final cut and capping, if need be.

**1.6 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

- .2 Departmental Representative will review and return revised schedules within five (5) working days.
- .3 Revise impractical schedule and resubmit within five (5) working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

## **1.7 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 The project schedule must show the different steps of the work while clearly indicating the critical path. Contractor must clearly define the anticipated progress of each activity required for the execution of work inside the prescribed milestones stated at article 1.5 of the present section, as well as their interdependence. The level of detail of the bar chart as well as a written explanatory document must allow the Department to verify the feasibility of the submitted schedule.
- .3 Ensure detailed Project Schedule separates the different phases and includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Identification of long lead material (such as sheet pile) for which the delivery is part of the critical path, including:
    - .1 Shop drawing, technical data sheet and certificate of conformity submittal and approval dates.
    - .2 Delivery date.
    - .3 Permits.
  - .3 Phase A:
    - .1 Mobilization.
    - .2 Zone 23 – Watercourse bed excavation / Rock anchors installation / Sheet pile installation / Temporary waler and temporary support installation\*
    - .3 Securing site and site restoration.
    - .4 Demobilizing and temporary bridge removal.
  - .4 Phase B:
    - .1 Site mobilization.
    - .2 Temporary bridge installation.
    - .3 Zone 23 – Masonry wall excavation / Masonry wall and caisson floor deconstruction / Void backfilling and slab foundation levelling / Filling concrete / Rebar, forming, concreting of slab on grade / Interlocking concrete block retaining wall construction / sheet pile temporary support removal / Backfilling / Finishing work\*.

- .4 Zones 22 – Restoration of the eastern end of the masonry wall / Restoration of slope protection stones / Filling of joints with concrete.
- .5 Zones 10-11 – Demolition / Footing rebar / Footing forming / Footing concreting / Wall rebar and anchors installation / Wall forming and concreting / Form stripping.
- .6 Zones 24 – Demolition / Footing rebar / Footing forming / Footing concreting / Wall rebar and anchors installation / Wall forming and concreting / Form stripping.
- .7 Zones 3 – Rip rap installation.
- .8 Temporary bridge removal and demobilization.
- .5 Phase C (optional):
  - .1 Mobilization.
  - .2 Zone 23 – sheet pile final cut / Capping installation
  - .3 Demobilization.

\* Subdivide work of zone 23 in minimum 10 sequences to help with the schedule comprehension.

## **1.8 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.
- .3 Send an updated project schedule to all involved parties 2 days before each project meetings.

## **1.9 PROJECT MEETINGS**

- .1 The project schedule presented at the kick off meeting will become, after its approval by the Department, the base line schedule.
- .2 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .3 Weather related delays with their remedial measures will be discussed and negotiated.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 45 00 – Quality control

**1.2 ADMINISTRATIVE**

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work especially for sheet piles and other products required at the beginning of the works. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension due to such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow seven (7) days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Standards.
    - .5 Relationship to existing work.
- .9 After Departmental Representative's review, distribute copies.

- .10 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit one (1) electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .15 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

#### **1.4 WORK PROCEDURES**

- .1 Prior to preconstruction meeting, Contractor must submit, for commentaries and approval of Departmental Representative, a document detailing its complete work and access procedures planned for the performance of the work in accordance with its schedule.

#### **1.5 SHEET PILING LAYOUT DRAWINGS**

- .1 Following his survey and his complementary underwater survey, the Contractor must provide a preliminary sheet piling layout drawing for the wall of zone 23.
- .2 Following the localization of the existing wooden crib beam by drilling survey, the Contractor must provide a layout plan of the zone 23 wall for pre-approval. Then, the contractor can start the work of seabed cleaning, drilling of anchorages and sheet piling.

#### **1.6 MOCK-UPS**

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.
- .2 Prior to painting guardrails, provide a paint sample in accordance with Section 01 45 00 - Quality Control.

**1.7 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit one (1) electronic and hard copy of color digital photography in jpg format, fine resolution monthly with progress statement and as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 The shooting date must appear directly on the photo.
- .4 Number of viewpoints.
  - .1 Viewpoints and their location as determined by Departmental Representative.

**1.8 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.
- .3 Transcripts must be issued within five (5) working days after holding a meeting.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal procedures
- .2 Section 01 35 43 - Environmental procedures
- .3 Section 35 42 19 – Preservation of water courses and wetlands.

### **1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB).
  - .1 CGSB 51-GP-51M-81, Polyethylene Sheet for Use in Building Construction.
- .2 Transportation and Dangerous Goods Act (1999).
- .3 Canadian Council of Ministers of the Environment (CCME) Documentation.
- .4 Environment Quality Act (LRQ, c. Q-2).
- .5 Regulation respecting the burial of contaminated soils (Q-2, r.18)
- .6 Regulation respecting contaminated soil storage and contaminated soil transfer stations (Q-2, r.46)
- .7 Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés (MDELCC, 2016)
- .8 Politique de protection des sols et réhabilitation des terrains contaminés – Plan d'action 2017-2021 (MDELCC, 2016)

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submittals for Progress Meetings: make submittals at least 24 hours prior to schedule progress meetings as follows:
  - .1 Updated progress schedule detailing activities. Include review of progress with respect to previously established dates for starting and stopping various stages of Work, major problems and action taken, injury reports, equipment breakdown, and material removal.
  - .2 Copy of transportation manifests, hours of service cards and receipts issued by the organization responsible for the disposal of waste and contaminated soil removed from the work area.
  - .3 Other information required by Departmental Representative or relevant to agenda for upcoming progress meeting.
- .3 Site Layout: within seven (7) days after date of Notice to Proceed and prior to mobilization to site, submit site layout drawings showing existing conditions and facilities, construction facilities and temporary controls provided by Contractor including following:
  - .1 Equipment and material staging areas.

#### **1.4 REGULATORY REQUIREMENTS**

- .1 Provide erosion and sediment control in accordance with division 35 42 19 – Preservation of Water regulations.
- .2 Comply with federal, provincial, and local anti-pollution laws, ordinances, codes, and regulations when disposing of waste materials, debris, and rubbish.
- .3 Work to meet or exceed minimum requirements established by federal, provincial, and local laws and regulations which are applicable.
  - .1 Contractor: responsible for complying with amendments as they become effective.
- .4 In event that compliance exceeds scope of work or conflicts with specific requirements of contract notify Departmental Representative immediately.

#### **1.5 SOIL STOCKPILING FACILITIES**

- .1 Provide, use and maintain temporary storage/stockpiling facilities as indicated.
- .2 For non-saturated soils: cover the ground of temporary storage areas with an 8 mils thick polyethylene membrane in places that will be used for stockpiling, to prevent contact with potentially contaminated soils. Contractor shall have waterproof tarpaulins designed to cover the stockpiled materials.
- .3 For water-saturated soils: place soils in leak tight buckets (containers) to confine potentially contaminated water.

#### **1.6 DUST AND PARTICULATE CONTROL**

- .1 Execute Work by methods to minimize raising dust from construction operations.
- .2 Implement and maintain dust and particulate control measures immediately as determined necessary by Departmental Representative during construction and in accordance with Province of Quebec regulations and action levels specified in Section 35 42 19 – Preservation of Water.
- .3 As minimum, use appropriate covers on trucks hauling fine or dusty material. Use watertight vehicles to haul wet materials.
- .4 Prevent dust from spreading to adjacent property sites.
- .5 Departmental Representative will stop work at any time when Contractor's control of dusts and particulates is inadequate for wind conditions present at site, or when air quality monitoring indicates that release of fugitive dusts and particulates into atmosphere equals or exceeds specified levels.
- .6 If Contractor's dust and particulate control is not sufficient for controlling dusts and particulates into atmosphere, stop work. Contractor must discuss procedures that Contractor proposes to resolve problem. Make necessary changes to operations prior to resuming excavation, handling, processing, or other work that may cause release of dusts or particulates.

**1.7 TEMPORARY STORAGE OF CONTAMINATED SOIL AND SEDIMENT**

- .1 To avoid contamination of the underlying and adjacent soils, the Contractor must:
  - .1 Prior to excavation work, prepare a contaminated soil management plan that clearly shows the layers of contamination. This plan should be based on the results of surveys and laboratory analyzes.
  - .2 Segregate soils according to their level of contamination and the stratigraphy observed.
  - .3 Store soil on a waterproof tarp and cover them, or store them in any other type of hermetic containment. The tarp must be securely fixed to prevent them from being lifted by the wind.
  - .4 The stock pile must be as far as possible from any aquatic environment.
- .2 Generally:
  - .1 Replace the soil as quickly as possible according to the levels of contamination initially observed and according to the initial stratigraphic profile.
  - .2 Machinery that has been in contact with contaminated soil should be properly cleaned before being used in other areas.
  - .3 Concrete from concrete pumps must be disposed into a confined and sealed enclosure. After curing, the concrete residues must be managed with the construction waste and disposed of in an approved facility.
  - .4 Where reclaimed soils exceed the existing CCME guidelines for residential / park areas or MDDELCC Criterion B, as required by the Departmental Representative, provide a minimum of 30 cm of clean soil.
  - .5 Ensure that any imported soil on Parks Canada property is a cropland that meets the latest standards of the City of Montreal and the Quebec Bureau of Standardization.
  - .6 Use clean backfill material free of contaminants and unwanted species.
  - .7 Avoid subsidence and minimize erosion by performing a good compaction of the new material (top soil, controlled backfill).
- .3 In addition to the requirements mentioned in the preceding article, the Contractor must, for the excavation of the grounds of zone 23:
  1. Excavated soils with a degree of contamination  $< C$  should be prioritized as backfill. Recovered contaminated material must be surface-covered with a 300 mm soil layer free of contaminants (150 mm non-contaminated Class B material and 150 mm topsoil).

The degree of contamination of the backfilled areas should not be increased because of the work (no B-C in an initially characterized area A-B). Soils  $> C$  will automatically be arranged. The Contractor must prepare a contaminated soil management plan showing the polygons and stratigraphy of contamination in Area 23.
  2. Conduct surveys at the beginning of the project to complete the environmental characterization study provided to the tender documents and

mandate a competent laboratory to characterize the zone 23. Ultimately, produce a contaminated soil management plan showing polygons and stratigraphy of contamination for all volumes to be excavated in zone 23.

- .4 In addition to the requirements referred to in section 1.7.1, the Contractor shall, for soil excavation along Zone 10:
  1. As the sediments characterized along zone 3 (see above, section 4.1.6) show higher grades than the CEO, they can not be put back in place and will have to be managed according to the regulations in force.
  - .2 Monitor the quantity of SS to ensure compliance with the threshold of 25 mg / l at 100 m from the dredging site.

### **1.8 POLLUTION CONTROL**

- .1 Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious toxic substances and pollutants produced by construction operations.
- .2 Be prepared to intercept, clean up, and dispose of spills or releases that may occur whether on land or water. Maintain materials and equipment required for cleanup of spills or releases readily accessible on site.
- .3 Promptly report spills and releases potentially causing damage to environment to:

**ENVIRONMENTAL EMERGENCIES SERVICE  
OF ENVIRONNEMENT CANADA  
24-hour telephone: 1-866-283-2333**

And to:

- .1 Authority having jurisdiction or interest in spill or release including conservation authority, water supply authorities, drainage authority, road authority, and fire department.
- .2 Owner of pollutant, if known.
- .3 Person having control over pollutant, if known.
- .4 Departmental Representative.
- .4 Contact manufacturer of pollutant if known and ascertain hazards involved, precautions required, and measures used in cleanup or mitigating action.
- .5 Take immediate action using available resources to contain and mitigate effects on environment and persons from spill or release.
- .6 Provide spill response materials including, containers, adsorbent, shovels, and personal protective equipment. Make spill response materials available on work site at all times in which hazardous materials or wastes are being handled or transported. Spill response materials: compatible with type of material being handled.

## **1.9 EROSION AND SEDIMENT CONTROL**

- .1 Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas. Prevent erosion and sedimentation.
- .2 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical. Strip vegetation, regrade, or otherwise develop to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and water courses, and repair damage caused by soil erosion and sedimentation as directed by Departmental Representative.
- .3 Provide and maintain temporary measures which may include, silt fences, hay or straw bales, ditches, geotextiles, drains, berms, terracing, riprap, temporary drainage piping, sedimentation basins, vegetative cover, dikes, and other construction required to prevent erosion and migration of silt, mud, sediment, and other debris off site or to other areas of site where damage might result, or that might otherwise be required by Laws and Regulations. Make sediment control measures available during construction.
- .4 Silt Fence: assembled, ready to install unit consisting of geotextile attached to drivable posts. Geotextile: uniform in texture and appearance, having no defects, flaws, or tears that would affect its physical properties; and contain sufficient ultraviolet ray inhibitor and stabilizers to provide minimum 2-year service life from outdoor exposure.
- .5 Net Backing: industrial polypropylene mesh joined to geotextile at both top and bottom with double stitching of heavy-duty cord, with minimum width of 750 mm.
- .6 Posts: sharpened wood, approximately 50 mm square, protruding below bottom of geotextile to allow minimum 450 mm embedment; post spacing 2.4 m maximum. Securely fasten each post to geotextile and net backing using suitable staples.
- .7 Plan construction procedures to avoid damage to work or equipment encroachment onto water bodies or drainage ditch banks. In event of damage, promptly take action to mitigate effects. Restore affected bank or water body to existing condition.
- .8 Installation:
  - .1 Construct temporary erosion control items as indicated.
  - .2 Check erosion and sediment control measures weekly after each rainfall; during prolonged rainfall check daily.
  - .3 Whenever sedimentation is caused by stripping vegetation, regrading, or other development, remove it from adjoining surfaces, drainage systems, and watercourses, and repair damage as quickly as possible.
  - .4 Prior to or during construction, Departmental Representative may require installation or construction of improvements to prevent or correct temporary conditions on site. Improvements may include berms, mulching, sediment traps, detention and retention basins, grading, planting, retaining walls, culverts, pipes, guardrails, temporary roads, and other measures

appropriate to specific condition. Temporary improvements must remain in place and in operation as necessary or until otherwise directed by Departmental Representative.

- .5 Unless Departmental Representative, remove temporary erosion and sediment control devices upon completion of Work. Spread accumulated sediments to form a suitable surface for seeding or dispose of, and shape area to permit natural drainage to satisfaction of Departmental Representative. Materials once removed become property of Contractor.
- .9 Do not disturb existing embankments or embankment protection.
- .10 Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- .11 If soil and debris from site accumulate in low areas, storm sewers, roadways, gutters, ditches, or other areas where in Departmental Representative's determination it is undesirable, remove accumulation and restore area to original condition.

#### **1.10 PROGRESS CLEANING**

- .1 Maintain cleanliness of Work and surrounding site to comply with federal, provincial, and local fire and safety laws, ordinances, codes, and regulations.
- .2 Co-ordinate cleaning operations with disposal operations to prevent accumulation of dust, dirt, debris, rubbish, and waste materials.

#### **1.11 REMOVAL AND DISPOSAL**

- .1 Remove surplus materials and temporary facilities from site.
- .2 Dispose of non-contaminated waste materials, litter, debris, and rubbish in an authorized site approved by Departmental Representative.
- .3 Do not burn or bury rubbish and waste materials on site.
- .4 Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
- .5 Do not discharge wastes into streams or waterways.
- .6 Dispose of and process the following materials at appropriate off-site facility identified by Contractor and approved by Departmental Representative:
  - .1 Debris including excess construction material.
  - .2 Non-contaminated litter and rubbish.
  - .3 All the excavated soil and sediments.
    - .1 Stockpile all excavated soil and sediments outside of the work site on a site identified by de Contractor and approved by the Departmental Representative.
    - .2 Characterize all excavated soil according to their degree of contamination and manage per "grille de gestion des sols contaminés" documents located in appendix 1 of specs.
- .7 Wood from demolition of the crib.

- .8 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

## **Part 2 MANAGEMENT OF CONTAMINATED SOILS**

### **2.1 NATURE AND SCOPE OF WORK**

- .1 For all work zones, except zone 23, the Contractor must note that:
  - .1 All soils excavated from the banks or dredged from the seabed shall be considered contaminated and must undergo an environmental characterization to establish their degree of contamination.
  - .2 When placing in temporary reserve potentially contaminated materials, materials coming from the excavation of the banks shall never be mixed with materials coming from seabed dredging.
  - .3 Potentially contaminated materials must be placed in temporary reserve on work site, at a location approved by Departmental Representative, for at least 72 hours to allow the Departmental Representative to take the samples needed for soil characterization.
  - .4 A 5 days period must be considered to obtain the test results.
  - .5 Once the degree of contamination of characterized soil is known, Contractor shall dispose soils to a treatment or disposal center authorized by the MDDELCC.
- .2 For Zone 23, contaminated soil management is required for excavated material. The Contractor must consider that:
  - .1 Excavated soils with a degree of contamination <C should be prioritized as backfill.
  - .2 Recovered contaminated material must be surface-covered with a 300 mm soil layer free of contaminants (150 mm of non-contaminated Class B material and 150 mm of topsoil).
  - .3 The degree of contamination of the backfilled areas should not be increased because of the work. For example, an initially characterized zone A-B cannot be backfilled with characterized materials C.
  - .4 Excavated soil with a degree of contamination > C must be automatically disposed.
- .3 It is the Contractor responsibility to prepare a contaminated soil management plan showing the contamination zones and strata in zone 23. To this end, the Contractor must:
  - .1 Conduct surveys at the beginning of the project to complete the environmental characterization study provided to the tender documents.
  - .2 Mandate a competent laboratory to characterize zone 23 and produce a contaminated soil management plan showing polygons and stratigraphy of contamination for the entire volumes to be excavated from this zone.
  - .3 Prioritize contaminated soils characterized <C as backfill in Area 23.
  - .4 In accordance with the specifications, dispose of excess volumes of soil.

## **2.2 CONTAMINATED WATER MANAGEMENT**

- .1 always, soils excavated or dredged from the seabed, saturated with water and possibly contaminated shall be confined in sealed buckets (containers) or other suitable devices, to avoid any runoff into the aquatic and terrestrial receiving environments.
- .2 It is forbidden to evacuate out of the site, to the municipal sewer system or directly into the river, contaminated water (leachate) from potentially contaminated soil. However, it is possible to reject possibly contaminated waters from saturated soils in line with the dredging area if, and only if, chemical analysis of these waters were conducted by Departmental Representative and an adequate treatment of the sediments is carried from an efficient sedimentation or filtration system and approved by the Ministry Representative. The outlet of the sedimentation or filtration system must be placed in the same area as the dredging area where the materials were taken and not cause additional turbidity.
- .3 Once the water saturated materials stored in a temporary stocking area, contractor shall proceed to the drying of these materials by pumping or other appropriate methods, and so as to recover the leachate. The collected leachate must be stored in a tank for sampling and analysis by the Departmental Representative.
- .4 The Laboratory commissioned by the Departmental Representative shall conduct sampling and analysis of potentially contaminated stored waste water for disposal. After receiving the results of analysis and the degree of contamination encountered, contractor must transfer the contents of the tanks without producing spills or releases, according to the Laboratory or Departmental Representative guidelines. Water shall be treated in situ following methods approved by the MDDELCC or sent to a disposal site authorized by the MDDELCC or returned to the sanitary sewer system depending on its degree of contamination and according to municipal, provincial and federal applicable laws and regulations.

## **2.3 TRANSPORTATION OF CONTAMINATED SOIL TO A WASTE MANAGEMENT CENTRE APPROVED BY THE MDDELCC**

1. The carrier of contaminated soil having a above the generic criteria « A » of MDDELCC must obtain a transport manifest for each load routed off-site to a waste management center authorized by MDDELCC. Transport manifest are prepared by the Laboratory or the Departmental Representative and given to the carrier. The manifest shall contain the following information:
  - .1 Carrier's name.
  - .2 Vehicle's registration.
  - .3 Date.
  - .4 Departure and arrival time.
  - .5 Loading source.
  - .6 Tonnage of the load.
  - .7 Type of materials (« A-B », « B-C », « > C »).
  - .8 Destination.
  - .9 City or Departmental representative's signature (issuer of the coupon).

- .10 Disposal center Representative's signature.
- .2 Transport manifest copy distribution:
  - .1 A copy of the manifest is kept on site by the City or Departmental Representative.
  - .2 A copy of the manifest is kept by the disposal center Representative.
  - .3 A copy of the filled out manifest is given the Contractor and the site Supervisor for compilation in the Unit prices table.
  - .4 A copy is kept by the carrier.

**2.4 OUTSIDE SITE FOR TEMPORARY STORAGE OF CONTAMINATED SOIL**

- .1 Shall the Contractor decides to temporary store excavated contaminated soil on a private terrain outside the worksite, Contractor must provide a copie of the agreement signed by the terrain's owner to the Departmental Representative. All applicable measures concerning stockpiling of contaminated soil contained in the present specification as well as the « Règlement sur le stockage et le centres de transfert de sols contaminés » by the MDDELCC must be strictly adhered to. Upon completion of work, a copy of of the receipt of the owner of the land shall be returned to the Departmental Representative.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 01 14 00 – *Work restriction.*
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 35 43 – Environmental procedures.

### **1.2 REFERENCES**

- .1 Province of Québec.
  - .1 Loi sur la santé et la sécurité du travail L.R.Q., c. S-2.1 (Act respecting occupational health and safety).
  - .2 Code de sécurité pour les travaux de construction L.R.Q., c. S-2.1, r.4 (Safety code for the construction industry).

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental representative, the site-specific prevention program, as outlined in the article “GENERAL REQUIREMENTS”, at least 10 days prior to the start of work.
- .3 Departmental representative will review Contractor’s site-specific prevention program and provide comments to Contractor within 10 days after receipt of the document. Revise plan as appropriate and resubmit to Departmental representative within 5 days after receipt of comments from Departmental representative. Departmental representative reserves the right not to authorize the start of work on the construction site as long as the content of the prevention program is not satisfactory. The Contractor shall then update his prevention program and resubmit it to the Departmental representative if the scope of work changes or if the working methods of the Contractor differ from his initial plans or for any other applicable new condition.
- .4 Departmental representative’s review of Contractor’s site-specific prevention program should not be construed as approval of the program and does not reduce the Contractor’s overall responsibility for construction Health and Safety during the work.
- .5 Submit copies of Contractor’s authorized representative’s construction site health and safety inspection reports to Departmental representative, at least once a week.
- .6 Submit to Departmental Representative within 24 hours a copy of any inspection report, correction notice or recommendation issued by Federal, Provincial and Territorial health and safety inspectors.
- .7 Submit to Departmental Representative within 24 hours an investigation report for any accident involving injury and any incident exposing a potential hazard.

- .1 The investigation report shall contain at least the following:
  - .1 Date, time and place of accident.
  - .2 Name of sub-contractor involved in the accident.
  - .3 Number of persons involved and condition of wounded.
  - .4 Witness identification.
  - .5 Detailed description of tasks performed at the time of the accident.
  - .6 Equipment being used to accomplish the tasks performed at the time of the accident.
  - .7 Corrective measures taken immediately after the accident.
  - .8 Causes of the accident.
  - .9 Preventive measures that have been put in place to prevent a similar accident.
- .8 Medical Surveillance: where prescribed by legislation, regulation or prevention program, submit certification of medical surveillance for construction site personnel prior to commencement of Work, and submit additional certifications for any new construction site personnel to Departmental representative.
- .9 Submit to Departmental representative an on-site Emergency Response Plan at the same time as the prevention program. The Emergency Response plan must contain the elements listed in the article “GENERAL REQUIREMENTS” of this section.
- .10 Submit to Departmental representative copies of all training certificates required for the application of the prevention program, in particular (if applicable) for the following:
  - .1 First aid in the workplace and cardiopulmonary resuscitation.
  - .2 Work likely to release asbestos dust (mandatory for all work where asbestos is present).
  - .3 Work in confined spaces (mandatory for all work in confined spaces).
  - .4 Lockout-tagout procedures (mandatory for all work requiring lockout).
  - .5 Safely operating forklift trucks (mandatory for all forklift usage).
  - .6 Safely operating elevating work platforms (mandatory for the use of all elevating platforms).
  - .7 Any other requirement of Regulations or the safety program.
- .11 In addition, the certifications of the *Cours de santé et sécurité générale pour les chantiers de construction* (General Health and Safety Training for Construction Sites) shall be available on demand on the construction site.

- .12 Engineer's plans and certificates of compliance: Contractor must submit to the Departmental representative and to the *Commission des normes, de l'équité, de la santé et de la sécurité du travail* (CNESST) a copy signed and sealed by engineer of all plans and certificates of compliance required pursuant to the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry) or by any other legislation or regulation or by any other clause in the specifications or in the contract. The Contractor must also submit a certificate of conformity signed by an engineer once the facility for which these plans were prepared has been completed and before a person uses the facility. A copy of these documents must be available on site at all times.

#### **1.4 FILING OF NOTICE OF CONSTRUCTION SITE OPENING**

- .1 Notice of construction site opening shall be submitted to the CNESST before work begins. A copy of such notice and acknowledgment of receipt from the CNESST shall be submitted to Departmental representative.
  - .1 At the completion of all the work, a notice of construction site closing shall be submitted to the CNESST, with a copy to Departmental representative.
- .2 The Contractor shall assume the role of being the Principal Contractor in the limits of the construction site and elsewhere where he must execute work within the framework of this project. The Contractor shall recognize the responsibility of being the Principal Contractor of the project and identify himself as such in the notice of the construction site opening he provides to the CNESST.
- .3 The Contractor shall accept to divide and identify the construction site adequately in order to define time and space at all times throughout the course of the project.

#### **1.5 HAZARD ASSESSMENT**

- .1 The contractor must perform construction site specific safety hazard assessment related to project.

#### **1.6 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental representative prior to commencement of Work.
- .2 Contractor's representative with decision power must attend any meetings at which construction site safety and health issues are to be discussed.
- .3 If it is anticipated that there will be 25 workers or more on the construction site at any given time, the Contractor shall set up a worksite committee and hold meetings as required by the *Code de sécurité pour les travaux de construction* (S-2.1, r. 4) (Safety code for the construction industry). A copy of the minutes of the meetings of the committee shall be provided to the Departmental representative no later than 5 days after the committee meeting.

#### **1.7 REGULATORY REQUIREMENTS**

- .1 Comply with all legislation, regulations and standards applicable to the construction site and its related activities.

- .2 Comply with specified standards and regulations to ensure safe operations on a site containing hazardous or toxic materials.
- .3 Always use the most recent version of the standards specified in the Code de sécurité pour les travaux de construction (S-2.1, r.4) (Safety code for the construction industry), notwithstanding the date indicated in that Code.

## **1.8 COMPLIANCE REQUIREMENTS**

- .1 Comply with the *Loi sur la santé et la sécurité du travail* (L.R.Q., c. S-2.1) (Act Respecting Occupational Health and Safety) and the *Code de sécurité pour les travaux de construction* (S-2.1, r. 4.) (Safety code for the construction industry) in addition to respecting all the requirements of this specification manual.

## **1.9 RESPONSIBILITIES**

- .1 The Contractor must acknowledge and assume all the tasks and obligations which customarily devolve upon a principal Contractor under the terms of the *Loi sur la santé et la sécurité du travail* (L.R.Q., ch. S-2.1) (Act Respecting Occupational Health and Safety) and the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry).
- .2 The Contractor must be responsible for health and safety of persons on construction site, safety of property on construction site and for the protection of persons adjacent to construction site and the environment to the extent that they may be affected by conduct of the work.
- .3 No matter the size or location of the construction site, the Contractor must clearly define the limits of the construction site by physical means and respect all specific regulation requirements applicable in this regard. The means chosen to define the limits of the construction site must be submitted to the Departmental representative.
- .4 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific prevention Plan.

## **1.10 WORK PERFORMED BY EXTERNAL CONTRACTORS**

- .1 Not used.

## **1.11 GENERAL REQUIREMENTS**

- .1 Before undertaking the work, prepare a site-specific prevention program based on the hazards identified according to the article “HAZARD ASSESSMENT” and the article “RISKS INHERENT TO THE WORKSITE” in this section. Apply this program in its totality from the start of the project until demobilization of all personnel from the construction site. The prevention program shall take into consideration the specific characteristics of the project and cover all the work to be executed on the construction site.
  - .1 The safety program must include at least the following:
    - .1 Company safety and health policy.
    - .2 Description of the stages of the work.

- .3 Total costs, schedule and projected workforce curves.
  - .4 Flow chart of safety and health responsibilities.
  - .5 Physical and material layout of the construction site.
  - .6 Risk assessment for each stage of the work, including preventive measures and the procedures for applying them.
  - .7 Identification of the preventive measures relative to the specific risks inherent to the worksite indicated in the article "RISKS INHERENT TO THE WORKSITE".
  - .8 Identification of preventive measures for health and safety of employees and / or public works site as indicated in the article "SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND PUBLIC".
  - .9 Training requirements.
  - .10 Procedures in case of accident/injury.
  - .11 Written commitment from all parties to comply with the safety program.
  - .12 Construction site inspection checklist based on the preventive measures.
  - .13 Emergency response plan which shall contain at least the following:
    - .1 Construction site evacuation procedures.
    - .2 Identification of resources (police, firefighters, ambulance services, etc.).
    - .3 Identification of persons in charge of the construction site;
    - .4 Identification of the first-aid attendants.
    - .5 Communication organizational chart (including the person responsible for the site and the Departmental representative).
    - .6 Training required for those responsible for applying the plan.
    - .7 Any other information necessary considering the characteristics of the site.
  - .14 If there's a specific evacuation procedure of the site, it will be provided to the Contractor by the representative of the Ministry; then the contractor will have to insert this procedure to his emergency response plan and transmit it to the Departmental Representative.
- .2 Departmental representative may respond in writing, where deficiencies or concerns are noted in the prevention program and may request resubmission with correction of deficiencies or concerns.
  - .3 In addition to the prevention program, during the course of the work the Contractor shall elaborate and submit to the Departmental representative specific written procedures for any work having a high risk factor of accident (for example: demolition procedures, specific installation procedures, hoisting plan, procedures

- for entering a confined space, procedures for interrupting electric power, etc.) or at the request of the Departmental representative.
- .4 The Contractor shall plan and organize work so as to eliminate the danger at source or ensure collective protection, thereby minimizing the use of personal protective equipment.
  - .5 Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.
  - .6 All mechanical equipment (for example, but not limited to: hoisting devices for persons or materials, excavators, concrete pumps, concrete saws) shall be inspected before delivery to the construction site. Before using any mechanical equipment, the Contractor shall obtain a certificate of compliance signed by a qualified mechanic dated less than a week prior to the arrival of each piece of equipment on the construction site; the certificate shall remain on the construction site and transmitted to the Departmental representative on demand.
  - .7 Ensure all inspections (daily, periodic, annual, etc.) for the hoisting devices for persons or materials required by the current standards are carried out and be able to provide a copy of the inspection certificates to the Departmental representative on demand.
  - .8 The Departmental representative can at all times, if he suspects a malfunction or the risk of an accident, order the immediate stop of any piece of equipment and require an inspection by a specialist of his choice.
  - .9 The Departmental representative must be consulted for the location of storing gas cylinders and tanks on the construction site.

## **1.12 RISKS INHERENT TO THE WORKSITE**

- .1 In addition to the risks related to the tasks to be carried out, personnel responsible for the execution of the work on the construction site will be exposed to the following risks, inherent to the area where the work will be executed. Without limiting his prevention program to these, the Contractor shall also include these elements in his program.
  - .1 At the worksite there is the presence of the following:
    - .1 Underground services (electric, gas, vapour, water system, etc.).
    - .2 Trees and landscaping to preserve and protect.
    - .3 The cramped site and the worksite machinery.
    - .4 Contaminated soil.
    - .5 Body of water close by.
    - .6 Navigation corridor.
    - .7 Vehicular and pedestrian traffic.

### **1.13 SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND PUBLIC**

- .1 The worksite is occupied by employees and/or the public during the following times: mid-may to mid-october. The Contractor shall consider the following specific requirements for the protection of employees and / or the public:
  - .1 Interference with the minimum waterway corridor is not allowed.
- .2 These requirements must be included in the Contractor's site-specific safety plan as well as any other measures provided by the Contractor to protect the health and safety of employees and / or the public on the site.

### **1.14 UNFORESEEN HAZARDS**

- .1 Whenever a source of danger not defined in the specifications or identified in the preliminary construction site inspection arises as a result of or in the course of the work, the Contractor must immediately suspend work, notify the person responsible for health and safety on the construction site, take appropriate temporary measures to protect the workers and the public and notify Departmental representative, both verbally and in writing. Then the Contractor must do the necessary modifications to the prevention program or apply the security measures required in order to resume work.

### **1.15 SAFETY OFFICER**

- .1 If the construction site meets the requirements of article 2.5.3 of the Code de la sécurité pour les travaux de construction (S-2.1, r.4) (Safety code for the construction industry), the Contractor needs to hire a competent person authorized as a safety officer and appoint this person full time from the beginning of the work. This person's tasks shall solely be dedicated to the management of health and safety on the construction site. This safety officer must have the following qualifications:
  - .1 have a safety officer certificate issued by the CNESST since at least 3 years;
  - .2 have site-related working experience specific to the activities associated with the present project;
  - .3 have working knowledge of occupational health and safety regulations in the workplace;
  - .4 be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter the construction site to perform work;
  - .5 be responsible for implementing, enforcing in detail and monitoring site-specific Contractor's Health and prevention program;
  - .6 be on construction site at all times during execution of work;
  - .7 inspect the work and ensure compliance with all regulatory requirements and those indicated in the contract documents or the site-specific prevention program.
  - .8 Keep a daily log of actions taken and submitting a copy to Departmental Representative each week.

The safety officer's certificate shall be submitted to the Departmental Representative before the start of the work.

- .2 When the hiring of a safety officer is not required or if this person is hired by the Departmental Representative, the Contractor shall designate a competent person to supervise and take responsibility for health and safety, no matter the size of the construction site or how many workers are present at the workplace. This person shall be on construction site at all times and be able to take all necessary measures to ensure the health and safety of persons and property at or in the immediate vicinity of the construction site and likely to be affected by any of the work. The Contractor shall submit the name of this person to the Departmental Representative before the start of work.

### **1.16 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on construction site in accordance with Acts and Regulations of the Province, and in consultation with Departmental representative.
- .2 At a minimum, the following information and documents must be posted in a location readily accessible to all workers:
  - .1 Notice of construction site opening.
  - .2 Identification of Principal Contractor.
  - .3 Company OSH policy.
  - .4 Site-specific prevention program.
  - .5 Emergency plan.
  - .6 Minutes of worksite committee meetings.
  - .7 Names of worksite committee representatives.
  - .8 Names of the first-aid attendants.
  - .9 Action reports and correction notices issued by the CNESST.

### **1.17 INSPECTION OF THE CONSTRUCTION SITE AND CORRECTION OF NON-COMPLIANCES**

- .1 Inspect the construction site and complete the construction site inspection checklist and submit it to the Departmental representative in accordance with the article "ACTION AND INFORMATIONAL SUBMITTALS" in this section.
- .2 Immediately take all necessary measures to correct any situations deemed non-compliant during the inspections mentioned in the previous paragraph or noticed by the authorities having jurisdiction or the Departmental representative or his agent.
- .3 Submit to Departmental representative written confirmation of all measures taken to correct the situation in case of non-compliance in matters pertaining to health and safety.
- .4 The Contractor shall give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order cessation and resuming of work as and when deemed necessary or desirable in the

interests of safety and health. This person should always act so that the safety and health of the public and construction site workers and environmental protection take precedence over cost and scheduling considerations.

- .5 The Departmental representative or his agent may order cessation of work if the Contractor does not make the corrections needed to conditions deemed non-compliant in matters pertaining to health and safety. Without limiting the scope of the preceding articles, the Departmental representative may order cessation of work if, in his view, there is any hazard or threat to the safety or health of construction site personnel or the public or to the environment.

### **1.18 PREVENTION OF VIOLENCE**

- .1 Health and safety management of Public Works and Government Services Canada construction sites include the implementation of measures designed to protect the psychological health of all persons who access the construction site where the work is taking place. Consequently, in addition to physical violence, verbal abuse, intimidation and harassment are not tolerated on the construction site. Any person who demonstrates such actions or behaviors will receive a warning and/or could be definitely expelled from the construction site by the Departmental representative.

### **1.19 BLASTING**

- .1 Blasting or other use of explosives is not permitted.

### **1.20 POWDER ACTUATED DEVICE**

- .1 Use powder actuated devices only after receipt of written permission from Departmental representative.
- .2 Any person using an explosive actuated tool shall hold a training certificate and meet all requirements of Section 7 of the Code de la sécurité pour les travaux de construction (S- 2.1, r. 4). (Safety code for the construction industry).
- .3 Any other explosive-actuated device shall be used in accordance with the manufacturer's directions and applicable standards and regulations.

### **1.21 USE OF PUBLIC ROADS**

- .1 Where it is necessary to encroach on a public road for operational reasons or to ensure the security of the workers, the occupants or the public (for example: the use of scaffolding, cranes, excavation work, etc.), the Contractor shall obtain at his own expense any authorizations and permits required by the competent authority.
- .2 The Contractor shall install at his own expense any signage, barricades or other devices needed to ensure the safety and security of the public and the Contractor's own facilities.

### **1.22 LOCKOUT-TAGOUT**

- .1 For all work on electrically or otherwise energized equipment, the Contractor shall draw up and implement a general lockout-tagout procedure and submit it to the Departmental Representative.

- .2 Supervisors and all workers concerned by work requiring lockout-tagout must have received training on lockout-tagout procedures by a recognized organization; Contractor shall submit training certificates to the Departmental Representative.
  - .3 Before starting the lockout-tagout procedure of a piece of equipment on an occupied site, Contractor must coordinate his work with the representative of the site if the interruption of the power sources can have an impact on the operations of the site or on its occupants.
  - .4 Contractor must designate a qualified person as responsible for the lockout-tagout and must make sure that that person prepares a lockout-tagout data sheet for each piece of equipment involved. The lockout-tagout data sheet must be submitted to the Departmental Representative at least 48 hours before the beginning of the work. The Departmental Representative will review the data sheet with the representative of the site if the work takes place in an existing building. The data sheets for lockout-tagout must contain at least the following information:
    - .1 description of work to carry out;
    - .2 identification, description and location of the circuit and/or piece of equipment to lockout-tagout;
    - .3 identification of energy sources that feeds the piece of equipment;
    - .4 identification of each cutout point;
    - .5 sequence of lockout-tagout and the release of residual energy as well as the sequence of unlocking;
    - .6 list of material needed for the lockout-tagout;
    - .7 method of verification of zero energy implementation;
    - .8 name and signature of the person who prepared the data sheet.
- When required by the Departmental Representative, Contractor must record all this information on the site's representative form.
- .5 At the time of lockout-tagout, the person responsible must date the data sheet and ensure that each worker involved in the work on the circuit/piece of equipment to lockout-tagout puts his name on the data sheet and signs it.

### **1.23 ELECTRICAL WORK**

- .1 Contractor shall ensure that all electrical work is executed by qualified employees in accordance with the provincial regulation respecting vocational training and qualification.
- .2 Contractor shall respect all requirements of standard CSA Z462 Workplace Electrical Safety Standard.
- .3 No repairs or alterations shall be carried out on any live equipment except where complete disconnection of the equipment is not feasible.
- .4 Contractor shall respect all requirements prescribed in paragraph "LOCKOUT-TAGOUT" in this section.
- .5 Contractor shall advise in writing the Departmental representative of all the work that cannot be done with de-energized equipment and obtain his authorization. Contractor shall demonstrate to the Departmental representative that it is

- impossible to do the work with de-energized equipment and provide all the information necessary to request and obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) before the beginning of the work, excluding for the exceptions indicated in standard CSA Z462 Workplace electrical safety.
- .6 The energized electrical work permit on must contain at least the following elements:
    - .1 Description of the circuit and equipment and its location.
    - .2 Justification for having to do the work in an energized condition.
    - .3 Description of safe work practices to apply.
    - .4 Results of the shock hazard analysis.
    - .5 Limit of the protective perimeter against electric shocks;
    - .6 Results of the arc flash hazard analysis.
    - .7 Description of the arc flash protection boundary.
    - .8 Description of the personal protective equipment required.
    - .9 Description of the means to limit access to unqualified persons.
    - .10 Proof that an information session has been carried out.
    - .11 Approval signature of the energized electrical work (by a person in authority or by the owner).
  - .7 If for the operational requirements of the occupants of the site the representative of the site requires that the Contractor performs work in an energized condition, the Contractor shall obtain all the information required to request and obtain obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) and have it signed by the representative of the site assigned by the Departmental representative before the beginning of the work.

#### **1.24 EXPOSURE TO SILICA**

For any interior or exterior work generating silica, the Contractor must respect the following requirements, in addition to those in the *Code de sécurité pour les travaux de construction S-2.1, r.4* (Safety code for the construction industry).

- .1 Work in wet environment or use tools with the inflow of water in order to reduce dustiness, if not, collect dust at the source and retain it with a high-efficiency filters not to propagate dust in the environment.
- .2 Clean surfaces and tools with water, never with compressed air.
- .3 Sand and pickle surfaces by using an abrasive containing less than 1% of silica (also called amorphous silica).
- .4 Install shields or other containment device to prevent silica dust from migrating toward other workers or the public.
- .5 Wear individual respiratory and ocular protection equipment during all the operations that could generate silica dust in accordance with the requirements of

the Code de sécurité pour les travaux de construction, S-2.1, r.4 (Safety code for the construction industry).

- .6 Wear coveralls to prevent contamination outside the construction site.
- .7 Do not eat, drink, or smoke in a dusty environment.
- .8 Wash the hands and the face before drinking, eating or smoking.

### **1.25 RESPIRATORY PROTECTION**

- .1 Contractor must ensure that all workers who must wear a respirator as part of their duties have received training for that purpose as well as fit testing of their respirator, in accordance with CSA Standard Z94.4 *Selection, use and care of respirators*. Submit the Certificates of the fit testings to the Departmental representative on demand.

### **1.26 FALL PROTECTION**

- .1 Plan and organize work so as to eliminate the risk of fall at the source or ensure collective protection, thereby minimizing the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness that complies with CSA standard CAN/CSA Z-259.10 M90. A safety belt must not be used as fall protection.
- .2 Every person using an elevating platform (scissors, telescopic mast, articulated mast, rotative mast, etc.) must have a training regarding this equipment.
- .3 The use of a safety harness is mandatory for all elevating platforms with telescopic, articulate or rotative mast.
- .4 Define the limits of the danger zone around each elevating platform.
- .5 All openings in a floor or roof must be surrounded by a guardrail or provided with a cover fixed to the floor able to withstand the loads to which it could be exposed, regardless of the size of the opening and the height of the fall it represents.
- .6 Everyone who works within two metres from a fall hazard of three metres or more must use a safety harness in accordance with the requirements of the regulation, unless there is a guardrail or another device offering an equivalent safety.
- .7 Despite the requirements of the regulation, the Departmental representative may require the installation of a guardrail or the use of a safety harness for specific situations presenting a risk of fall less than three metres.

### **1.27 SCAFFOLDINGS**

In addition to the requirements of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Contractor who uses scaffoldings must respect the following requirements:

- .1 Foundation
  - .1 Scaffoldings shall be installed on a solid foundation so that it does not slip or rock.
  - .2 Contractors wishing to install scaffoldings on a roof, overhang, canopy or awning shall submit their calculations and loads, as well as plans signed and

- sealed by an engineer to the Departmental representative and obtain his authorization before beginning installation.
- .3 For all scaffoldings with span between two supports greater than three meters, Contractors shall submit plans signed and sealed by an engineer to the Departmental Representative.
- .2 Assembly, bracing and mooring
    - .1 All scaffoldings shall be assembled, braced and moored in accordance with the manufacturer's instructions and the provisions of the Code de sécurité pour les travaux de construction (Safety code for the construction industry).
    - .2 Where a situation requires the removal of part of the scaffoldings (e.g., crosspieces), the Contractor shall submit to the Departmental representative an assembly procedure signed and sealed by an engineer certifying that the scaffolding assembled in that manner will allow the work to be done safely given the loads to which it will be subject.
    - .3 For scaffoldings where the span between two supports is greater than three metres, the Contractor shall provide the Departmental representative an assembly plan signed and sealed by an engineer.
  - .3 Protection against falls during assembly
    - .1 Workers exposed to the risk of falling more than three metres shall be protected against falls at all times during assembly.
  - .4 Platforms
    - .1 Scaffolding platforms shall be designed and installed in accordance with the provisions of the Code de sécurité pour les travaux de construction (Safety code for the construction industry).
    - .2 If planks are used, they shall be approved and stamped in accordance with section 3.9.8 of the Code de sécurité pour les travaux de construction (Safety code for the construction industry).
    - .3 Scaffoldings of four sections (or six metres) high or more shall have a full platform covering the entire surface between the putlogs every three metres high or fraction thereof, and the components of that platform shall not be moved at any time to create an intermediate landing.
  - .5 Guardrails
    - .1 A guardrail shall be installed on every landing.
    - .2 Cross braces shall not be considered as guardrails.
    - .3 If the platforms are not covering the entire surface between the putlogs, the guardrail must be installed just above the edge of the platform so that there is no empty horizontal space between the platform and the guardrail.
    - .4 Where scaffoldings has four sections (or six metres) high or more and full platforms are required, the guardrails shall be installed on each landing at the start of work and shall remain in place until the work is completed.

.6 Access

- .1 The Contractor shall ensure that access to the scaffoldings does not compromise worker safety.
- .2 Where the platforms of the scaffoldings are comprised of planks, ladders shall be installed in such a way that planks extending beyond the platform do not block the way up or down.
- .3 Notwithstanding the provisions of the Code de sécurité pour les travaux de construction (Safety code for the construction industry), stairs shall be installed on all scaffoldings that have six or more rows of uprights or is six sections (or nine metres) high or higher.

.7 Protection of the public and occupants

- .1 When scaffoldings are installed in a zone accessible to the public, the Contractor shall take the necessary measures to prevent the public from having access to them and, if applicable, to the work or storage area located in the vicinity of these scaffolding.
- .2 Contractor must install covered walkways, nets or other similar devices to protect workers, the public and the occupants against falling objects. The means of protection must be approved by the Departmental representative.

.8 Engineering plans

- .1 In addition to those required by the Code de sécurité pour les travaux de construction (Safety code for the construction industry), the Departmental representative reserves the right to require engineering plans for other types or configurations of scaffoldings.
- .2 A plan signed and sealed by an engineer is required for all scaffoldings that will be covered with a canvas, a tarpaulin or any other material that has wind resistance.
- .3 A plan signed and sealed by an engineer is required for the temporary bridge.
- .4 A certificate of conformity signed by an engineer is required in all cases where an engineering plan is required and this, before anybody uses the facility. A copy of these documents must always be available on the construction site.

**1.28 CONFINED SPACES**

- .1 Not used.

**1.29 ASBESTOS EXPOSURE**

It is not anticipated that the work covered by the present specifications involves the manipulation of materials containing asbestos; however, if the Contractor or the Departmental Representative or his agent discover materials which are susceptible of containing asbestos, the Contractor must immediately stop the work and advise the Departmental Representative. If more investigation demonstrates that the materials do contain asbestos, the Contractor shall comply with the following requirements.

- .1 Prior to starting any work likely to emit asbestos dust, the Contractor must:

- .1 Provide a written procedure for the work, identifying the risk level of the work (low, moderate, high), as defined in section 3.23 of the Code de la sécurité pour les travaux de construction S 2.1, r 4, (Safety code for the construction industry). This procedure must take into account all the requirements of that section 3.23.
- .2 Submit certificates that demonstrate that all workers involved in the work have received training on asbestos hazards and on the procedure required in the preceding paragraph.
- .3 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

### **1.30 FUNGAL CONTAMINATION**

It is not anticipated that the work covered by the present specifications involves the manipulation of materials contaminated by mould; however, if the Contractor or the Departmental Representative or his agent discover materials which are susceptible of being contaminated by mould, the Contractor must immediately stop the work and advise the Departmental Representative. If more investigation demonstrates that the materials do contain mould, the Contractor shall comply with the following requirements.

- .1 Prior to starting any work where workers are likely to be in contact with materials contaminated by mould, the Contractor must:
  - .1 Provide a written procedure for the work which respects all the requirements of the Code de la sécurité pour les travaux de construction S-2.1, r 4, (Safety code for the construction industry), as well as the requirements indicated in the document “Mould Guidelines for the Canadian Construction Industry” published by the Canadian Construction Association (<http://www.cca-acc.com/documents/electronic/cca82/cca82.pdf>).
  - .2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

### **1.31 SANDBLASTING**

Prior to starting any sandblasting work, the Contractor must:

- .1 Provide a written procedure of the work that meets the requirements of section 3.20. of the Code de sécurité pour les travaux de construction, S-2.1, r.4 (Safety code for the Construction Industry).
- .2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.
- .3 All sanding and sandblasting work shall be done by using an abrasive containing less than 1 % of silica.

### **1.32 LEAD-BASE PAINT REMOVAL**

Prior to all work where workers are likely to handle materials containing lead-base paint or other substances containing lead, the Contractor must:

- .1 Provide a written procedure for the work which respects all the requirements of the Code de sécurité pour les travaux de construction S-2.1, r 4, (Safety code for the construction industry), as well as the requirements indicated in the document “Guideline for Lead on Construction Projects” published by the Ontario Ministry of Labour ([http://www.labour.gov.on.ca/english/hs/pdf/gl\\_lead.pdf](http://www.labour.gov.on.ca/english/hs/pdf/gl_lead.pdf)). If there is a discrepancy between the Québec regulation and the Ontario document, the most stringent requirement shall apply.
- .2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

### **1.33 EXCAVATION WORK**

In addition to the requirements of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Contractor who performs the digging of trenches or excavations must respect the following requirements:

- .1 Fill out the following form and submit it to the Departmental representative before beginning to excavation work.
- .2 Submit to the Departmental representative, as appropriate, the following documents:
  - .1 Plans and specifications, signed and sealed by an engineer, of the shoring needed to be installed for the excavation work.
  - .2 Engineer’s advice specifying the wall angles of the trench or excavation.



### **1.34 LIFTING LOADS WITH CRANE OR BOOM TRUCK**

- .1 Unless specified otherwise, the Contractor must prepare a hoisting plan and submit it to the Departmental representative for all lifting operations done with a crane or a boom truck at least 5 days before these lifting operations begin. The hoisting plan must contain at a minimum the information listed at the end of this article.
- .2 The hoisting plan must be signed and sealed by an engineer for the following lifting operations:
  - .1 Lifting elements of existing work, to demolish or recover.
  - .2 Lifting mechanical/electrical equipment.
  - .3 Lifting large dimensions or very heavy loads.
  - .4 All other lifting operation, in accordance with the requirements of the Departmental Representative.
- .3 In addition to the above requirements, the Contractor must plan the hoisting operations in a way as to avoid that the loads pass over the occupied zones on the site. When there is no alternative, the hoisting plan must absolutely be signed and sealed by an engineer and must guarantee the security of the occupants in that zone; the plan must also be approved by the Departmental representative. The Departmental representative can, if he deems necessary, require that the work be done at night or on weekends.
- .4 Upon the beginning of the work on the construction site, the Contractor must submit the list of the hoisting plans anticipated for the whole project to the Departmental representative. That list shall be updated as needed if changes occur during the work.
- .5 In addition to the mechanical service inspection certificate, the annual inspection certificate and the crane logbook must be aboard all cranes and boom truck cabs.
- .6 The entire lifting area shall be marked off to prevent the entry of non-authorized persons.
- .7 The Contractor shall carefully inspect all of the slings and lifting accessories and make sure that those in poor condition are destroyed and scrapped.
- .8 Compressed-gas cylinders shall be lifted with a basket specially designed for this purpose.
- .9 Minimum content of hoisting plan:
  - .1 Sketch indicating at a minimum, the location of the crane, the surrounding facilities, the zone covered by the hoisting operations, the pedestrian's pathways and vehicular routes, the security perimeter, etc.
  - .2 Weight of loads.
  - .3 Dimensions of loads.
  - .4 List of hoisting devices and weight of each.
  - .5 Total weight lifted.
  - .6 Maximum height of obstacles to clear.

- .7 Height of loads lifting relative to the surface of the roof (in the case of loads to be placed on roofs).
- .8 Use of guide cables.
- .9 Type of crane used.
- .10 Crane capacity.
- .11 Boom length.
- .12 Boom angle.
- .13 Crane's radius of action.
- .14 Deployment of stabilizers.
- .15 Percentage usage of the crane's capacity.
- .16 Verification confirmation of hoisting equipment.
- .17 Identification of the crane operator and the person responsible for the hoisting operations with date and signatures.

### **1.35 HOT WORK**

- .1 Hot work means any work where a flame is used or a source of ignition may be produced, i.e., riveting, welding, cutting, grinding, burning, heating, etc.
- .2 Before the beginning of each shift of work and for each sector, the Contractor must obtain a "Hot Work Permit" emitted by the person responsible for the site.
- .3 A working portable fire extinguisher suitable to the fire risk shall be available and easily accessible within a 5 m radius from any flame, spark source or intense heat.
- .4 The Contractor must appoint an individual to do continuous monitoring of the fire risks for a period of one (1) hour after the end of the shift of hot work. This individual shall sign the section for this purpose on the permit and give it to the person in charge of the construction site after the one-hour period.
- .5 When the hot work is done in areas where there is combustible materials or where the walls, ceilings or floors are made of or covered with combustible materials, a final inspection of the work area must be scheduled four (4) hours after the work has finished. Unless specified otherwise by the Departmental representative, the Contractor must assign a person to carry out this monitoring.
- .6 Welding and cutting
  - .1 In addition to the requirements prescribed in the preceding paragraphs, the Contractor must respect the following requirements:
    - .1 Welding and cutting work must be carried out in accordance with the requirements of the *Code de Sécurité pour les travaux de construction, S-2.1, r.4* (Safety code for the construction industry) and CSA standard W117.2, Safety in Cutting, Welding and Allied Processes.
    - .2 Air extraction system with filters must be used for all welding and cutting work performed inside.

- .3 Stop all activities producing flammable or combustible gas, vapours or dust in the vicinity of the welding or cutting work.
- .4 Store all compressed gas cylinder on a fireproof fabric and make sure that the room is well ventilated.
- .5 Store all oxygen cylinders more than 6 m from a flammable gas cylinder (ex: acetylene) or a combustible such as oil or grease, unless the oxygen cylinder is separated from it by a wall made of non-combustible material as mentioned in the article 3.13.4 of the Code de sécurité pour les travaux de construction, S-2, r. 6 (Safety code for the construction industry).
- .6 Store the cylinders far from all heat sources.
- .7 Not to store the cylinders close to the staircases, exits, corridors and elevators.
- .8 Do not put acetylene in contact with metals such as silver, mercury, copper and alloys of brass having more than 65 % copper, to avoid the risk of an explosive reaction.
- .9 Check that welding equipment with electric arc has the necessary tension and are grounded.
- .10 Ensure that the conducting wires of the electric welding equipment are not damaged.
- .11 Place the welding equipment on a flat ground away from the bad weather.
- .12 Install fireproof canvas when the welding work is done in a superposition and where there is the risk of falling sparks.
- .13 Move away or protect the combustible materials which are closer than 15 metres from the welding work.
- .14 Prohibition to weld or cut any closed container.
- .15 Do not perform any cutting, welding or work with a naked flame on a container, a tank, a pipe or other container containing a flammable or explosive substance unless:
  - .1 They have been cleaned and air samples indicating that work can be done without danger has been taken.
  - .2 Provisions to ensure the safety of the workers have been made.

### **1.36 ROOFING WORK**

- .1 Not used.

### **1.37 STEEL STRUCTURE ERECTION OR DISMANTLING WORK**

- .1 Not used.

### **1.38 WORK NEAR BODIES OF WATER**

- .1 For all work done near a body of water (such as work above water, work on a wharf, work on the edge of a watercourse, etc.), the Contractor must respect the requirement of the following paragraphs in addition to those in article 2.10.13 du *Code de sécurité pour les travaux de construction* (Safety code for the Construction Industry).
- .2 The Contractor must plan his work in a way to implement safety measures to prevent any worker from falling in the water. The use of these measures should be favoured over the wearing of a life jacket.
- .3 If no other safety measure can protect the workers, ensure that they all wear a life jacket that is able to maintain their head out of the water and keep them afloat without any effort of the arms.
- .4 Submit the following documents to the Departmental representative before the beginning of the work:
  - .1 Description of the body of water.
  - .2 Description of the work done next to this body of water.
  - .3 Plan of transportation on water adapted to the work and to the characteristics of the body of water.
  - .4 Rescue plan adapted to the work and to the characteristics of the body of water.
- .5 Each of the document listed above must contain at a minimum the information required in section 11 of the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry).
- .6 If there is the possibility that all or part of the work can be done during the winter, the safety measures included in the documents required above must be adapted accordingly.
- .7 The Contractor must submit to the Departmental representative the certificate of training required in article 11.2 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry) for the following individuals:
  - .1 The person assigned to prepare the documents required in the preceding paragraph.
  - .2 Each person responsible for the transport or rescue operations.
- .8 If the rescue plan stipulates the use of a vessel, the Contractor must submit to Departmental representative the competency card or certificate for the individuals in the rescue team for his work, issued by Transport Canada.
- .9 The Contractor must include in his weekly inspection checklist the devices required in the articles 11.4 and 11.5 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry).
- .10 Ensure that a rescue vessel moored and in the water is available at each place where a worker may fall in the water. However, a vessel may serve more than one workplace on the same construction site provided the distance between any of these workplaces and the vessel is less than 30 m.

- .11 Where the construction site is a wharf, a pier, a quay or any similar structure, a ladder with at least two (2) rungs below the surface of the water shall be installed on the front of the structure every 60 m.

### **1.39 INTERIOR USE OF INTERNAL COMBUSTION ENGINES**

- .1 Not used.

### **1.40 TEMPORARY HEATING**

- .1 In addition to respecting section 3.11 of the Code de sécurité pour les travaux de construction (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.
- .2 A portable fire extinguisher must be available at all times near the heating units, no matter what type of heating is used.
- .3 The heating units must always be used in accordance with the manufacturer's specifications.
- .4 If applicable, the canvas or tarpaulins used next to the heating units must be solidly fixed so as not to be projected on the heaters, on the pipes connected to the heaters or on any other heat source.
- .5 The gas cylinders must be installed in a way that they are protected from vehicle and other equipment traffic.
- .6 For the use of heating units other than electric, the Contractor must install a carbon monoxide detector in the work area, next to the heating units and/or the workers, throughout the course of the heating period. The Contractor must immediately apply the corrective measures required to the heating units if the detector's alarm goes off.
- .7 The Contractor must ensure a minimum surveillance of the heating units outside the hours of work (nights and weekends). He must submit a surveillance plan to the Departmental representative before the use of the heating units.

### **1.41 WORK NEAR OVERHEAD POWER LINES**

- .1 When there is an overhead power line in the work zone and that the Contractor chooses to apply paragraph b) of article 5.2.2 of the *Code de sécurité pour les travaux de construction* (2.1, r.4) (Safety code for the Construction Industry), a copy of the agreement with the electrical power company and a copy of the work process, required in the article 5.2.2 b), must be submitted to the Departmental representative before the beginning of the work in relation to these documents.

### **1.42 DIVING OPERATIONS**

- .1 In accepting this contract, the Contractor agrees to satisfy the following requirements:
  - .1 Compliance with all the requirements of the Règlement sur la santé et la sécurité du travail (S-2.1, r.13) (Regulation respecting occupational health and safety), more precisely section XXVI. I, entitled Travail effectué en plongée (Underwater Work). Compliance, furthermore, with the latest editions of standards CAN/CSA Z275.2 – Occupational Safety code for Diving Operations, CAN/CSA Z275.1 – Hyperbaric Chambers and

- CAN/CSA Z275.4 – Competency Standard for Diving Operations. In the event of conflict between these requirements, the most stringent requirement shall apply.
- .2 In addition to the above, in cases where construction work is involved, compliance with the Code de sécurité pour les travaux de construction (S-2.1, r.4) (Safety code for the Construction Industry).
  - .2 Before starting the work, submit to the Departmental representative the following documents, as per the *Règlement sur la santé et la sécurité au travail* (S-2.1, r.13) (Regulation respecting occupational health and safety):
    - .1 The professional diving training certificate of each member of the dive team OR a document recognizing the skills of those persons in accordance with the Competency Standard for Diving Operations, CAN/CSA Z275.4-02, as per section 312.8 of the Regulation;
    - .2 The workplace first-aid training certificate of each member of the dive team;
    - .3 The medical certificate of each member of the dive team;
    - .4 For each dive included in this contract, a dive plan containing the following information, in addition to that required under the *Règlement sur la santé et la sécurité au travail* (Regulation respecting occupational health and safety):
      - .1 The thermal protection to be used.
      - .2 The repetitive dive factor.
      - .3 The no-decompression limit.
      - .4 The circumstances in which the dive must be terminated.
      - .5 The procedures to be followed to ensure that machinery, equipment or devices that could create a hazard have been locked out.
      - .6 The decompression table to be used, as required.
      - .7 Notification confirming that a system for communicating with the Service d'assistance médicale pour les urgences en plongée (Medical assistance service for diving emergency) is available at the diving station at all times.
    - .5 The Contractor shall take into account the following specific characteristics of the worksite, and adapt its dive plan accordingly:
      - .1 Diving in waterway corridor.
      - .2 Diving under ice.
      - .3 Diving in site with contaminated sediments.
    - .6 Where the dive takes place at one of the following locations, provide the Departmental representative confirmation that the authorities concerned have been notified:
      - .1 Upstream or downstream from a hydraulic structure or submerged water line.

- .2 In marine waterways.;
- .3 In port facilities.
- .7 If the dive station is more than 2 metres above the water, provide the Departmental representative:
  - .1 A drawing of the equipment used to transport the worker through the air-water interface, if a device other than a stage is used for that purpose.
  - .2 A drawing of the device used to hoist the stage or other device, unless that device is a crane or boom truck.
- .8 If the dive is carried out from a vessel, provide the Departmental representative the following documents:
  - .1 Proof of qualification of the vessel operator.
  - .2 The vessel's certificate of compliance from Transport Canada.
- .9 Before starting the work, carry out an underwater rescue simulation at the site, as required under section 312.31 of the Règlement sur la santé et la sécurité du travail (S-2.1, r.13) (Regulation respecting occupational health and safety).
- .10 On a daily basis, complete and provide to the Departmental representative a checklist confirming the presence and condition of the equipment required at the dive site as per the dive plan.
- .11 Ensure that all other documents required under section XXVI of the Règlement sur la santé et la sécurité du travail (S-2.1, r.13) (Regulation respecting occupational health and safety) are available at the construction site at all times (diving logbook, diver's logbook, etc.).

### 1.43 HEALTH AND SAFETY SUBORDINATION AGREEMENT

**Project:** \_\_\_\_\_ **Address:** \_\_\_\_\_

#### EXTERNAL CONTRACTOR

I hereby agree to submit to the authority of (name of the Principal Contractor's business) \_\_\_\_\_, which is the Principal Contractor for the project indicated above during the entire duration of our work on the construction site. Accordingly, I confirm that I have reviewed the Principal Contractor's prevention program, and I agree to:

- inform my employees of the content of the Principal Contractor's prevention program and ensure that its content are complied with at all times;
- apply the prevention program that is specific to the activities that we carry out under this project;
- inform the Principal Contractor of my actions or dealings on the construction site and obtain the Principal Contractor's agreement before the start of work; and
- follow the health and safety directives provided by the representative of the Principal Contractor on the construction site and, depending on requirements, attend training sessions and health and safety meetings organized by the representative of the Principal Contractor.

Name of representative: \_\_\_\_\_

Name of business: \_\_\_\_\_

Description of work to be done on the construction site: \_\_\_\_\_

Approximate dates of work (start-end): \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

#### PRINCIPAL CONTRACTOR

I hereby agree to allow the business (name of external contractor) \_\_\_\_\_ to perform the work under this project indicated above and, as Principal Contractor, to take the necessary steps to protect the health and safety of workers on the construction site. Should the Contractor repeatedly refuse or fail to comply with my directives, I agree to inform PWGSC's Departmental representative of this and to provide documentary evidence of my actions or dealings with the Contractor.

Name of representative: \_\_\_\_\_

Name of the Principal Contractor's business: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Submit a completed and signed copy to PWGSC's Departmental representative

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 01 33 00 – Submittal procedures
- .2 01 35 15.43 – Special procedures for contaminated sites
- .3 01 74 11 - Cleaning
- .4 01 74 21 – Construction demolition waste management and disposal

### **1.2 REFERENCES**

- .1 Definitions
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
- .2 References
  - .1 U.S. Environmental Protection Agency (EPA)/Office of Water
    - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
    - .2 EPA General Construction permit (GCP) 2012.
  - .2 Historic canals regulations (DORS/93-220)

### **1.3 ACTION AND INFORMATIONS SUBMITTALS**

- .1 Submit in accordance with section 01 33 00 – Submittal procedures.
- .2 Technical data :
  - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Prior to the commencement of work or materials delivery, submit an environmental protection plan for review and approval by Departmental Representative.
- .4 The environmental protection plan must include a complete overview of the potential or known environmental issues to be solve during construction.
- .5 All the actions in the environmental protection plan must be presented at a level of details according to the environmental problems and to the complete execution of work.

- .6 The environmental protection plan must include:
  - .1 Names of site supervisors.
  - .2 Names and qualifications of the persons who are responsible for the manifests pertaining to the hazardous waste materials.
  - .3 Names and qualifications of the persons who are responsible for site-staff training.
  - .4 Description of the training program of the site-staff assigned to environmental protection.
  - .5 Complete list of all the equipment including inspections certificates.
  - .6 Erosion and sediment control plan with all the measures to be implemented at work site including site supervision and production of reports for monitoring and reporting conditions in compliance with the federal, provincial and municipal laws.
  - .7 Drawings must indicate locations of proposed temporary excavations or roads embankments, stream crossings, materials storage areas, structures and sanitary facilities, including methods to control runoff waters and to contain materials on work site.
  - .8 Work area plan showing proposed activity in each working zone and identifying restricted and prohibited working areas.
    - .1 Work area plan must include all the measures fixing the restricted and prohibited working areas and all of the protection method used to all the elements which need to be protected in the authorised working areas.
  - .9 Spill control plan must include procedures, instructions, and reports to be produced in case of controlled substances spilling.
  - .10 Non-hazardous and hazardous solid waste disposal plan which include all the disposal methods and sites for excavation waste.
  - .11 Air pollution control plan specifying the actions must be taken to control dust, waste materials and debris in the work area.
  - .12 Contaminant prevention plan specifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing hazardous substances storage and handling in compliance with federal, provincial, and municipal laws and regulations.
  - .13 Waste water management plan identifying methods and procedures for discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
  - .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan to be included and updated, as required.

.7 Monitoring environmental surveillance schedule will be transmitted at contract award. Contractor shall fully cooperate to adopt the mitigations measures related to the environmental authorizations achieved.

#### **1.4 FIRE**

.1 Fire and waste burning on the work site are prohibited.

.2 Provide supervision and fires protection measures as directed.

#### **1.5 DRAINAGE**

.1 Develop and submit erosion and sediment control plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, federal, provincial, and municipal laws and regulations.

.2 Storm Water Pollution Prevention Plan (SWPPP) can substituted the erosion and sediment control plan.

.3 Provide temporary drainage and pumping required to keep excavations and site free from water.

.4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

#### **1.6 SITE CLEARING AND PLANT PROTECTION**

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal only to those indicated on plans.

#### **1.7 WORK ADJACENT TO WATERWAYS**

.1 Use waterway beds for borrow material is forbidden.

.2 Waterways to be kept free of excavated fill, waste material and debris.

.3 Design and construct temporary crossings to minimize erosion to waterways.

.4 Do not skid logs or construction materials across waterways.

.5 Avoid indicated spawning beds when constructing temporary crossings of waterways.

## **1.8 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
  - .1 Provide temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

## **1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL**

- .1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan must include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

## **1.10 PREVENTION DURING WORK**

- .1 Physical environment protection
  - .1 Use equipments in good operating conditions and be sure of its exhaust silencer.
  - .2 Respect the municipal regulations regarding noise nuisances.
  - .3 Manage the site to minimize the work generating significant sound activities.
  - .4 Avoid starting up equipment when not in use to limit the emission of exhaust fumes. Manage the site to minimize the work generating significant sound activities.
  - .5 Avoid handling and transporting materials that can easily be eroded under high wind conditions or when a dust plume is visible.
  - .6 Ensure that fine materials used for construction as well as residues are contained during transportation (lorries equipped with fabric to restrict dust dispersion).
  - .7 Cover with a tarpauline the soil excavated behind the Masonry Wall in Area 23, if stored on site.
  - .8 Store debris from refurbishment work inside sealed drums.
  - .9 Excavated soils and sediments must be disposed in accordance with current standards (ensure that their deposit does not degrade the receiving environment).

- .10 Limit the movement of residues in the water body when removing the containment facilities from the demolition materials.
- .11 Dispose of debris as and when required by the sites authorized by the MDDELCC.
- .12 Remove, as soon as possible, any debris accidentally introduced into the aquatic environment.
- .13 Avoid taking borrowing materials in the watercourse.
- .14 Protect with a sediment barrier or cover with geotextile any temporary accumulation of unconsolidated material, including soil, located within 30 m of an aquatic environment for a period of more than 24 hours to avoid sediment transport to the watercourse.
- .15 Quickly cover top soil with peat or tarpaulin in case of rain, as needed.
- .16 Ensure that concrete cleaning water is contained and recovered. If a treatment system (portable sedimentation pond, filters, or other such facilities) is to be used, it must prevent contaminants and sediment from dripping into sewers and waterbodies. Use the necessary means to define the method of disposal of sediment collected from wastewater and ensure compliance with applicable discharge standards.
- .17 Use a temporary platform-type device at each worksite to collect the debris and minimize its dispersion in the water.
- .18 Lock out hazardous materials left on the site outside of construction hours.
- .19 Use retention tanks (110% capacity) or impermeable fuel mats with a berm for all stationary equipment and machinery (generators, compressors, etc.) located on the shore. Inspect facilities during periods of rain to prevent overflowing.
- .20 Do not leave any vehicle, machinery or gasoline equipment on a pier or within 10 meters of the course or body of water during site closure hours unless it is enclosed by a watertight enclosure. If this is not possible, soil protection measures must be provided under the equipment or machinery for the entire period mentioned above (eg containment tank with a volume equivalent to at least 110% of the volume of the fuel tank. equipment or machinery).
- .21 Do not dispose of snow in a canal in accordance with the Historic Canal Regulations.
- .22 Avoid excavation during heavy rain or high winds.
- .23 Limit in situ storage time of excavated material.
- .24 Ensure that soils do not migrate to other environment, either by air, water runoff or vehicle transit.
- .25 Put in place effective measures to limit the intake of sediments from the shipyard to the aquatic environment and ensure their maintenance (eg sediment barrier, berm, sediment trap, temporary stabilization of embankments, diversion of water towards vegetation). The measures must remain effective during the temporary closure of the site and during periods of flood or heavy rain.

- .26 If necessary, pipe pump water to a sedimentation pond before discharging into the Sainte-Anne-de-Bellevue Canal (CSAN) on the north side of the downstream pier.
- .27 Immediately stabilize disturbed banks or shorelines by any activity related to the project to prevent erosion or sedimentation.
- .28 Manage the water flowing to the site, as well as that pumped or diverted off the site, so that the sediment is decanted before it reaches the water (pump or divert the water to a vegetation zone or to build a settling basin or other filtering device).
- .29 Monitor the concentration of Suspended matter (MS) from water discharged from the work area, sedimentation basin or downstream of the turbidity curtain, if applicable. The CCME guideline for the protection of aquatic life indicates a maximum increase in suspended solids of 25 mg / l (or 8 NTU) over the background concentration for a short-term release (eg less than 24 hours).
- .30 Confine, sample and treat, if required, concrete mixer wash water and other equipment to meet the surface water quality requirements of the CCME's MDDELCC (Protection of Aquatic Life - Acute Impact), for protection of aquatic life and CMM 2008-47 for suspended solids, pH and C10-C50 prior to release to the environment.
- .31 Use equipment that uses biodegradable hydraulic oil.
- .32 Recover quickly any spilled quantity, even minimal.
- .33 Notify Parks Canada Project Authority and Public Services and Procurement Canada Project Authority immediately of any spills. Report any land-based spill to Environment and Climate Change Canada's Environmental Emergency Service at 1-866-283-2333. Notify the Coast Guard of any spills at 1 800 363-4735. Notify Emergency-Environment at 1-866-694-5454.
- .34 A complete kit containing all the necessary equipment necessary to circumscribe an accidental leak must always be onsite in the event of an accidental spill.
- .35 Ensure that an emergency spill procedure is established and workers are notified.
- .36 Apply emergency measures, in the event of an accidental spill, to control the spill and remedy the situation that caused it (breakage, mishandling, etc.).
- .37 Contain the leak, clean the contaminated area and transport contaminated material to authorized sites.
- .38 Identify and use a temporary, isolated site storage site for fuel, oil, other petroleum products or contaminants.
- .39 Place the temporary storage site in a location where there is no risk of contamination of the shoreline, more than 30 m from the shoreline, and in a low slope area.
- .40 Avoid refueling machinery within 30 m of a watercourse.

- .41 Restore the CSAN or watercourse bed to its original state and retain the same or similar substrate after work, if applicable (not applicable for Zone 3).
- .42 Ensure that construction materials used in a watercourse are handled and used in a manner that prevents release or leaching into water of substances that may be harmful to aquatic organisms.
- .43 Ensure that all work carried out in water or structures in the water does not obstruct the passage of fish and does not reduce the width of the watercourse or its flow.
- .44 Implement effective erosion and sediment control measures prior to commencement of work to avoid sediment transport to the water body.
- .45 Advocate the mobilization or circulation of vehicles on durable or already disturbed surfaces (eg paved road, gravel surface, high resilience disturbed area).
- .46 Avoid vehicle movements during periods of heavy rainfall where soils become saturated with water.
- .47 Limit the area of remediated and exposed soil zones and stabilize them as quickly as possible. If necessary, use ground coverings, mulch, straw, sod, granular material, erosion control, or other devices that may reduce soil erosion during prolonged exposure and intensive use locations.
- .48 Maintain a degree of compaction and aeration corresponding to the initial state (before work) of the rehabilitated surfaces to prevent the transport and circulation of soil particles.
- .49 Limit storage areas to durable surfaces.
- .2 Biological environment protection
  - .1 Establish and delimit a protection area around trees and shrubs to preserve (eg ribbons, barriers, burlap around trunks, etc.) so as not to damage them or affect the root system, trunks and branches.
  - .2 Ensure that machinery is clean and free of invasive alien species and weeds when arriving at the site and maintain as it does.
  - .3 Upon completion, thoroughly clean machinery that has come into contact with invasive alien species to avoid dispersal into new areas.
  - .4 Mark the boundaries of the work area
  - .5 Movement of machinery and vehicles is prohibited outside of the work area.
  - .6 Limit the felling, the pruning and the clearing to the minimum in order to preserve the vegetation. No tree can be felled without prior authorization from the Departmental Representative.
  - .7 Tree planting and sod establishment no earlier than May 1, 2019.
  - .8 Restore and re-green the site at the end of the work. This includes re-establishing vegetation cover in areas previously approved by Parks Canada using a variety of fast-growing, low-maintenance native species. In addition, they will need to be adapted to the project area to enhance the local plant community.

- .9 Branches and trunks of trees should be cut flush, as close to the ground and stem.
- .10 During pruning work, cut the branches above the collar, at the anchorage point of the branch on the trunk, avoiding to leave snags on the tree.
- .11 Cut branches more than 3 cm in diameter in three (3) steps:
  - .1 Make an incision approximately 30-40 cm from the trunk, the depth of which should be equivalent to one third of the diameter of the branch.
  - .2 A few centimeters higher, saw the entire branch.
  - .3 Saw the tree, taking care to always protect the edge and neck of the branch (saw about 1 cm after the collar)
- .12 Ensure cuts are clean (no tears) and minimize cutting surface (right vs. oblique).
- .13 For small branches, bevel about 0.5 cm above a bud at an angle of about 30 degrees in the same direction as the bud.
- .14 The size of the branches should be such as to prevent the accumulation of water on the wound as much as possible, which promotes the establishment of mold, parasites and fungi.
- .15 Tree pruning in the spring should be done before bud burst.
- .16 Trunks and other recovered materials should be transported to a storage site without leaving debris and without damaging the other trees or landscape elements. Trunks and other recovered materials should not be dragged into the river.
- .17 If grubbing is required, stumps, roots, inlaid trunks and other non-soil debris must be removed and shaken in order to release any soil and loose rock before transporting them to a designated area.
- .18 Vegetation debris must be removed as quickly as possible from the Work site and transported off site for disposal.
- .19 Store removed vegetation in areas already subject to disturbance to minimize disturbance area.
- .20 Do not use pesticide near water (within 3 m of the high water mark). If pesticides are required elsewhere on the work site, a pesticide treatment plan must be submitted for approval by the Departmental Representative.
- .21 Plan work in water for specific periods to protect fish, including eggs, juveniles and spawning adults, and the organisms they feed on (August 1 to March 31: allowed period).
- .22 Take precaution to minimize the work in the water.
- .23 Work when the rate of water flow is low to further reduce the risk of harm to fish and fish habitat or to isolate the work area from the flow.
- .24 Take the necessary measures to prevent materials such as paint, primers, blasting abrasives, anti-rust solvents, degreasers, grout, poured concrete or any other chemical to be dropped in the course of water.

- .25 Establish plan that must be implemented immediately after a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.
- .26 Perform regular inspection and maintenance of erosion and sediment controls as well as structures during construction.
- .27 Take steps to isolate the site (ex.: turbidity curtains, containment curtains) to contain suspended sediment in the in water area where the work must be performed.
- .28 Engage a qualified ichthyological wildlife professional who will capture all fish caught in a confined or isolated section of the site and safely release them elsewhere in the same watercourse.
- .29 Install a grid at water intakes to prevent entrainment or impingement of fish.
- .30 In the case of diving sheet pile, gradually drive it to allow the fish present on the periphery to flee the work area.
- .31 Install sheet piles from upstream to downstream and remove from downstream to upstream, if applicable.
- .32 Check for nests or dens in the area before pruning and avoid disturbing occupied nests or dens.
- .33 Slaughter outside the nesting season for migratory birds that nest in the area if nests are present. The regional period established for the St. Lawrence Plain by Environment and Climate Change Canada is from the beginning of April to the end of August.
- .34 Allow any individual to leave the enclosure in a safe manner, in the event of the presence of turtles on the site or any other wildlife species.
- .35 Do not set traps, poison or kill animals on site .
- .36 Ensure that on-site workers are made aware of sensitive species (eg, geographic turtles) and that they immediately report any incidental sightings to the Departmental Representative.
- .37 Provide an observer before the work who will perform a visual inspection of the site to identify the presence of turtles on surface.
- .38 At all times during the work, contact the Parks Canada Representative when a turtle is observed in or near the work site. A designated person from Parks Canada will be able to act if the turtle does not leave the site by itself.
- .39 Mark the working area boundaries.
- .40 Ban the movement of machinery and vehicles outside the work area.
- .41 Limit obstruction to CSAN and NHS sites only when required.
- .42 Do not store hazardous residual materials on site and dispose of them off site in accordance with applicable regulations.
- .43 Remove all non-hazardous waste from the site and provide sufficient containers to store household waste on a daily basis.

- .44 Implement an appropriate management program to contain and dispose of waste such as scrap metal, used asphalt pavement and concrete debris. This waste must be as much as possible isolated at source and recycled.
- .45 Establish a debris and scrap disposal plan and ensure use of a local site duly authorized by the MDDELCC.

#### **1.11 COMMUN REED PRESENCE (ZONES 10 AND 11)**

- .1 Properly disposed common reed as well as its clippings and reapings.
- .2 Reed wastes must be transported in thick plastic bag in the way to dry/rot in the sun then be burned when plants are dried and dead or transported in a certified engineered landfill.
- .3 Cleaning and inspecting all equipments or floating equipments used in water and make sure of no invading exotic species presence before and after work.

#### **1.12 NOTIFICATION**

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor, after receipt of such notice, inform the Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
  - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

#### **1.13 TURBIDITY CURTAIN**

- .1 A turbidity curtain is required during concrete work to confine suspended solids and must be taken off only when water ph is less than or equal to 9.
- .2 Ensure that no fish are trapped in the enclosure defined by the turbidity curtain while concrete work.
- .3 In presence of dead or dying fish, immediately stop concrete work and communicate with the Departmental Representative.
- .4 The turbidity curtain, when installed near a waterway, must meet the following requirements:
  - .1 Yellow or orange with yellow reflective tape of 10 cm x 30 cm long spaced by not more than 0,5 meters.
  - .2 The curtain must be anchored to withstand current velocities.
  - .3 The turbidity curtain consists of a geotextile membrane held vertically by a sheath that contains a waterline at its upper edge and with another sheath sewn on its inside edge for ballasting the membrane at the bottom of the water. The turbidity curtain must form a continuous unit and the

ballast must allow the bottom of the curtain to lean completely on the seabed with a heavy enough chain.

- .4 Contractor shall provide a waiting period of at least 24 hours between the end of work in an area and the removal of turbidity curtain. The removal of the turbidity curtain must not increase the total suspended solids by over 25 mg/l compared to the concentrations at the seabed. Contractor shall demonstrate compliance with this standard.

## **Parti 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.

## **Parti 3 EXECUTION**

### **3.1 CLEANING**

- .1 Cleaning site during work: all cleaning activities during work must be conform to 01 41 11 - Cleaning section.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Not used.

### **1.2 INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.
- .5 Contractor must provide the following bathymetric surveys for control purposes:
  - .1 Bathymetric survey of the seabed on a distance of 10 m from walls before and after the works (zones 3, 10, 11, 22, 23 and 24).
  - .2 The grid of the bathymetry must be realized with a spacing of one meter between each point. All survey records must be incorporated into a final report at the end of the work.
- .6 Contractor must conduct an underwater televised inspection at the completion of each zone to confirm the compliance of the repairs or other underwater work. Each of the inspections must be immediately returned to the Departmental Representative for approval. All underwater inspections completed during construction must be provided at the end of the work as a final report.

### **1.3 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

**1.4 ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 If the Contractor chooses to do the work without a temporary bridge, he shall ensure access to the inspection agencies designated by the Department, including the labor and equipment.
- .3 Co-operate to provide reasonable facilities for such access.

**1.5 PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.6 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

**1.7 REPORTS**

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.

**1.8 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.

**1.9 MILL TESTS**

- .1 Submit mill test certificates as requested or required of specification Sections.

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 33 00 – Submittal procedures
- .2 01 52 00 – Construction facilities
- .3 01 56 00 – Temporary barriers and enclosures.

**1.2 INSTALLATION AND REMOVAL**

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

**1.3 DEWATERING**

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

**1.4 WATER SUPPLY**

- .1 The Contractor must ensure his water supply continuously and provide all necessary measures for the insulation of pipes and heating depending on the temperature.
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

**1.5 TEMPORARY POWER AND LIGHT**

- .1 Provide and maintain the power supply required for his site.
- .2 No power source is available on the pier and will not be provided to the Contractor by the Department.
- .3 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal. No power source coming from Parks Canada buildings is available between October 15, 2016 and May 15, 2017.
- .4 Provide and maintain temporary lighting throughout project.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 33 00 - Submittal procedures
- .2 01 51 00 - Temporary utilities
- .3 01 56 00 - Temporary barriers and enclosures

**1.2 RESPONSIBILITY**

- .1 The Contractor shall be responsible, without limitation
  - .1 Construction site office;
  - .2 Departmental Representative's office;
  - .3 Storage of equipment;
  - .4 Storage area for equipment and materials;
  - .5 Temporary access;
  - .6 Construction site toilet;
  - .7 Compaction water and dust suppressant water;
  - .8 Equipment and worker security;
  - .9 Maintenance of access roads (cleaning in summer, leveling of gravel roads and installation of dust suppressant, snow removal of site access);
  - .10 Waste management;
  - .11 Telephone and internet access;
  - .12 Customs fee, if required;
  - .13 Fences and temporary fences;
  - .14 Night work lighting.

**1.3 INSTALLATION AND REMOVAL**

- .1 The site limits shown on the plans must be rigorously respected.
- .2 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

#### **1.4 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.

#### **1.5 HOISTING**

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists cranes to be operated by qualified operator.

#### **1.6 SITE STORAGE/LOADING**

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

#### **1.7 CONSTRUCTION PARKING**

- .1 Parking is not permitted on site.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways where used by Contractor's equipment.

#### **1.8 OFFICES**

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
- .4 The Contractor must provide, from his site facilities, a meeting room that can accommodate a minimum of 12 people.
- .5 Departmental Representative's Site office.
  - .1 Provide temporary office for Departmental Representative.
  - .2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
  - .3 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.
  - .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.

- .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10 % upward light component.
- .6 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.
- .7 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
- .8 Maintain in clean condition.

### **1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

### **1.10 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

### **1.11 CONSTRUCTION SIGNAGE**

- .1 Provide project identification site sign comprising framing, and one 1200 x 2400 mm signboard as detailed and as described below.
  - .1 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
  - .2 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
  - .3 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CAN/CGSB 1.189.
  - .4 Fasteners: hot-dip galvanized steel nails and carriage bolts.
  - .5 Vinyl sign face: printed project identification, self-adhesive, vinyl film overlay, supplied by Departmental Representative.
- .2 Direct requests for approval to erect Contractor signboard to Departmental Representative. For consideration general appearance of Contractor signboard must conform to project identification site sign. Wording in both official languages.
- .3 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .4 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

**1.12 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 The temporary bridge is exclusive to the Contractor and Departmental Representatives. Access must be secured with a barrier or fencing to close the access to unauthorized vehicles or pedestrians. Adequate signalization must also be put in place.
- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .6 Construct access and haul roads necessary.
- .7 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .9 Dust control: adequate to ensure safe operation at all times.
- .10 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .11 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .12 Provide snow removal during period of Work.
- .13 Provide temporary access for pedestrian when a site that it normally accessible by pedestrian and not in the Work site is now inaccessible because of the Work.
- .14 Provide temporary access on water during period of Work.
- .15 Remove, upon completion of work, haul roads designated by Departmental Representative.

**1.13 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 14 00 – Work restriction
- .2 01 52 00 – Construction facilities
- .3 01 74 21 – Construction demolition waste management and disposal

**1.2 INSTALLATION AND REMOVAL**

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

**1.3 HOARDING**

- .1 Erect temporary site enclosure using a 2440 mm of high «OMEGA» type fence. At each 2 sections, these fences must be reinforced with stiffeners and concrete blocks. Prior the commencement of work, contractor must provide a sketch showing the installation method for review and approval by Departmental Representative.
- .2 Before installation, contractor must valid the fences positions with the Departmental Representative
- .3 Advertising displays are not permitted on the work site (including fences, scaffold, etc.) which is relevant to the contractor and subcontractors.
- .4 Contractor must maintain and repair temporary fences if needed during the work which include the replacement of broken parts and painting.
- .5 Temporary fences must be following the appropriate municipal law or regulation.
- .6 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.
- .7 Provide access lockable gate to protect the working area.

**1.4 GUARD RAILS AND BARRICADES**

- .1 Provide secure, rigid guard rails and barricades around deep excavations and in places where the risk of falling into water is possible.
- .2 Provide and install all the elements with requirements made by the competent authorities (Commission de la santé et de la sécurité au travail, etc.)

**1.5 SPECIFICATION FOR COLD WEATHER CONCRETING**

1. If shelters are needed for cold weather concreting, Contractor must be responsible of the conception and construction of these structures to resist snow and wind loads. Temporary heating and sealing of openings must be included to maintain an intern temperature within the acceptable limits in accordance to corresponding section.

**1.6 DUST TIGHT SCREENS**

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.
- .2 Maintain and relocate protection until such work is complete.
- .3 If needed, provide fences recover for public protection.

**1.7 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to work.
- .2 Provide temporary bridge, access ramp for the maritime equipments or any temporary measures access required to the complete execution of work.

**1.8 TRAFFIC AND PEDESTRIAN CIRCULATION**

- .1 Traffic and pedestrian circulation must be conformed to the needs of Departmental Representative.
- .2 Provides protections and detours measures for traffic and pedestrian circulation including surveillance services, flagmen and police officers in the case of encroachment of Ste-Anne street (if needed).
- .3 Except for the contractor, pedestrian circulation is not allowed on south area of Sainte-Anne-de-Bellevue canal during work.
- .4 Pedestrian circulation is allowed on south area of Sainte-Anne-de-Bellevue canal during summer period (4<sup>th</sup> of May to 9<sup>th</sup> of October 2018).
- .5 Contractor must provide protection measures for the pedestrian circulation during summer period (4<sup>th</sup> of May to 9<sup>th</sup> of October 2018). The storage area must be secured and all damage area must be repaired.
- .6 Respect roads and sidewalks constraints presented in section 01 14 00 – Work restrictions. The work area must be organized in respect of the project site preparation sketch and temporary installations related to section 01 52 00 - Construction facilities.
- .7 Contractor is responsible, at his expensive, for designing, organising and coordinating the pedestrian circulation regarding competent authorities. Therefore, contractor is responsible for organising and planning police officers to the work site as competent authorities shall required.

**1.9 ACCESS TO EMERGENCY VEHICLES**

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.10 MOTORIZED MARINE EQUIPMENT FOR WORK SURVEILLANCE**

- .1 Provide to the Departmental Representative the access to motorized marine equipment (boats, barges) necessary for work surveillance.

**1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

- .1 Protect surrounding private and public property from damage during performance of work.
- .2 Be responsible for damage incurred.

**1.12 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 PRODUCTS**

**2.1 NOTE USED**

- .1 **Not used.**

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCES**

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents.

**1.3 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

**1.4 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

## **1.5 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

## **1.6 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.

## **1.7 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

### **1.8 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

### **1.9 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

### **1.10 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

### **1.11 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

### **1.12 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.

- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.13 PROTECTION OF WORK IN PROGRESS**

- .1 Prevent overloading of parts of Work.

**1.14 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCES**

- .1 Owner's identification of existing survey control points and property limits.

**1.3 QUALIFICATIONS OF SURVEYOR**

- .1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.

**1.4 SURVEY REFERENCE POINTS**

- .1 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .2 Make no changes or relocations without prior written notice to Departmental Representative.
- .3 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .4 Require surveyor to replace control points in accordance with original survey control.

**1.5 SURVEY REQUIREMENTS**

- .1 Stake for grading, fill and topsoil placement and landscaping features.
- .2 Establish foundation elevations.

**1.6 EXISTING SERVICES**

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
- .2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

**1.7 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

**1.8 RECORDS**

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 Record locations of maintained, re-routed and abandoned service lines.

**1.9 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform with Contract Documents.

**1.10 SUBSURFACE CONDITIONS**

- .1 Promptly notify Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
  - .1 Structural integrity of elements of project.
  - .2 The integrity of water-repellent elements or elements exposed to bad weather.
  - .3 Efficiency, maintenance or safety of functional elements.
  - .4 The final finish of the apparent elements.
  - .5 The work of another contractor.
- .3 Include in request:
  - .1 Identification of project.
  - .2 Location and description of affected Work.
  - .3 Description of proposed Work, and products to be used.
  - .4 The impact of cutting and patching work on those performed by the Owner or another contractor;
  - .5 Written permission from the contractor involved
  - .6 Date and time work will be executed.

**1.3 MATERIALS**

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

**1.4 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 Make a high-resolution photographic survey of the Zone 23 masonry wall from the mobilization at the site.
- .3 Survey the existing wooden crib with divers from zone 23, specifically the extremities of this zone to plan the connections of the sheet pile curtain to the existing structure.
- .4 Following excavation of the existing elements, inspect them for any condition that may affect the performance of the work.
- .5 Prior to demolition work, masonry stones in Zone 23 shall be inspected and

jointly measured between the Departmental Representative and the Contractor for payment.

- .6 Beginning of cutting or patching means acceptance of existing conditions.
- .7 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .8 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

### **1.5 EXECUTION**

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .6 Restore work with new products in accordance with requirements of Contract Documents.
- .7 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 74 21 - Construction demolition waste management and disposal

**1.2 REFERENCES**

- .1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions "C", In Effect as Of: May 14, 2004.
- .2 Historic Canals Regulations (SOR/93-220)

**1.3 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to site.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for the disposal of debris and waste materials. If necessary, provide a dust screen.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.

**1.4 FINAL CLEANING**

- .1 When Work is substantially performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

- .8 Remove dirt and other disfiguration from exterior surfaces.
- .9 Repair any damage caused on site to public or private property affected by the work, the ponds, storage of equipment, materials and environmental storage
- .10 Once Work is completed, deliver the land affected by the work into a higher condition or the same as it was before the work started.
- .11 Once Work is completed, remove 150 mm of material for damaged grassed areas and add 150 mm of new topsoil and sod.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's waste management goal and Contractor's proposed Waste Reduction Work plan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 Protect environment and prevent environmental pollution damage.

### **1.2 REFERENCES**

- .1 Definitions:
  - .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.
  - .2 Class III: non-hazardous waste - construction renovation and demolition waste.
  - .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities.
  - .4 Inert Fill: inert waste - exclusively asphalt and concrete.
  - .5 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
  - .6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
  - .7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
  - .8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
  - .9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
    - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
    - .2 Returning reusable items including pallets or unused products to vendors.
  - .10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

- .11 Separate Condition: refers to waste sorted into individual types.
- .12 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .13 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating required submittal and reporting requirements.
- .14 Waste Reduction Work plan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities.

### **1.3 DOCUMENTS**

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
  - .1 Waste Reduction Work plan.
  - .2 Waste Source Separation Program.

### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
  - .1 One (1) copy and one (1) electronic copy of completed Waste Reduction Work plan (WRW).
  - .2 One (1) copy and one (1) electronic copy of Waste Source Separation Program (WSSP).
  - .3 One paper copy and one electronic copy of the Source Waste Sorting Program (SWSP).
- .3 Prepare and submit on monthly basis, throughout project the following:
  - .1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.
- .4 Submit prior to final payment the following:
  - .1 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

### **1.5 WASTE REDUCTION WORKPLAN (WRW)**

- .1 Prepare and submit WRW at least ten (10) days prior to project start-up.
- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations.
- .3 WRW should include but not limited to:
  - .1 Applicable regulations.

- .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
- .3 Destination of materials identified.
- .4 Deconstruction/disassembly techniques and schedules.
- .5 Methods to collect, separate, and reduce generated wastes.
- .6 Location of waste bins on-site.
- .7 Security of on-site stock piles and waste bins.
- .8 Protection of personnel, sub-contractors.
- .9 Clear labelling of storage areas.
- .10 Training plan for contractor and sub-contractors.
- .11 Methods to track and report results reliably.
- .12 Details on materials handling and removal procedures.
- .13 Recycler and reclaimer requirements.
- .14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.
- .15 Requirements for monitoring on-site wastes management activities.
- .4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .5 Post WRW or summary where workers at site are able to review content.
- .6 Monitor and report on waste reduction by documenting total volume (in tons) and cost of actual waste removed from project.

#### **1.6 WASTE SOURCE SEPARATION PROGRAM (WSSP)**

- .1 As part of Waste Reduction Work plan, prepare WSSP prior to project start-up.
- .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.
- .3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .5 Locate containers to facilitate deposit of materials without hindering daily operations.
- .6 Provide training for sub-contractors and workers in handling and separation of materials for reuse and/or recycling.
- .7 Locate separated materials in area which minimizes material damage.

- .8 Clearly and securely label containers to identify types/conditions of materials accepted and assist sub-contractors and workers in separating materials accordingly.
- .9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.
- .10 On-site sale of salvaged materials is not permitted unless authorized in writing by Departmental Representative and provided that site safety regulations and security requirements are adhered to.

#### **1.7 USE OF SITE AND FACILITIES**

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility.

#### **1.8 WASTE PROCESSING SITES**

- .1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

#### **1.9 STORAGE, HANDLING AND PROTECTION**

- .1 No location is available on site to store materials in stockpile. Therefore, stockpiling on site is prohibited.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Protect surface drainage, mechanical and electrical from damage and blockage.
- .7 Separate and store materials produced during project in designated areas.
- .8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

- .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

### **1.10 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil and paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
  - .1 Number and size of bins.
  - .2 Waste type of each bin.
  - .3 Total tonnage generated.
  - .4 Tonnage reused or recycled.
  - .5 Reused or recycled waste destination.
- .4 Remove materials on-site as Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis.
- .6 Characterize and then dispose of all excavated soils and sediments at appropriate off-site facility identified by Contractor and approved by Departmental Representative.
- .7 Characterize for the presence of creosote and then dispose of all wooden crib at appropriate off-site facility identified by Contractor and approved by Departmental Representative.
- .8 The waste material management must consider that existing steel railing paint to be dismantled contains lead.

### **1.11 SCHEDULING**

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 EXECUTION**

### **3.1 APPLICATION**

- .1 Do Work in compliance with WRW and WSSP.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.3 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT**

Province	Address	General Inquires	Fax
Quebec	Ministère du développement durable, de l'Environnement et de la lutte contre les changements climatiques, Siège Social  150, boul. René-Lévesque Est, Québec (Québec) G1R 4Y1	418 521-3830 1 800 561-1616	418 646-5974
	Conseil de la conservation et de l'environnement  800, place d'Youville, 19 <sup>e</sup> étage Québec (QC) G1R 3P4	418 643-3818	

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 74 11 - Cleaning

**1.2 REFERENCES**

- .1 Canadian Environmental Protection Act (CEPA)
  - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Departmental Representative's Inspection:
    - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
    - .2 Contractor to correct Work as directed.
  - .2 Completion Tasks: submit written certificates in English and French that tasks have been performed as follows:
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Work: complete and ready for final inspection.
- .3 Final Inspection:
  - .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
  - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
  - .3 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .4 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
  - .5 Final Payment:
    - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
    - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

**1.4 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 31 19 - Project meetings
- .2 01 33 00 - Submittal procedures
- .3 01 71 00 - Examination and preparation

**1.2 REFERENCES**

- .1 Canadian Environmental Protection Act (CEPA).
  - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
    - .1 Verify Project requirements.
  - .2 Departmental Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .3 Provide evidence, if requested, for type, source and quality of products supplied.

**1.5 FORMAT**

- .1 Provide 1:1 scaled CAD files in dwg and PDF format on CD and a paper copy.
- .2 The project record documents must be submitted to the Departmental representative for comments before final version.

**1.6 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project.
  - .1 Date of submission.
  - .2 Names, addresses, and telephone numbers of Departmental Representative and Contractor with name of their representatives.

- .3 Schedule of products and systems, indexed to content of volume.
- .2 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .3 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .4 Reports: all reports requested to ensure the completion of work including but not limited to: underwater inspection report, soil characterization report for area 23, record of preserved stones.
- .5 Photographic report: produce a weekly photographic report to show the completed works.
- .6 All ministerial on-site instructions and list.
- .7 All Proposed Change Notices and List.
- .8 warranty.
- .9 As-built documents.

#### **1.7 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Environmental protection plan.
  - .7 Field test records.
  - .8 Inspection certificates.
  - .9 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.

- .5 Keep record documents and samples available for inspection by Departmental Representative.

## **1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of blue line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colors for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .3 Field changes of dimension and detail.
  - .4 Changes made by change orders.
  - .5 Details not on original Contract Drawings.
  - .6 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications and field test records required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

## **1.9 FINAL SURVEY**

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 33 00 - Submittal procedures
- .2 01 35 29.06 - Health and Safety
- .3 01 35 43 – Environmental procedures
- .4 01 56 00 – Temporary barriers and enclosures
- .5 01 74 21 - Construction demolition waste management and disposal

**1.2 REFERENCES**

- .1 Canadian Environmental Protection Act (CEPA).
  - .1 CCME PN 1326-2008, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.
- .2 CSA International
  - .1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Respect requirements for submittals required.
- .3 Shop Drawings:
  - .1 Submit for review and approval demolition drawings and technical datasheets in accordance with Section 01 33 00 - Submittal Procedures
  - .2 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
  - .3 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .4 When requested by the competent authorities, submit to the Departmental Representative for approval drawings of shoring and bracing of walls prior to demolition work. These drawings must be prepared by a qualified engineer, licensed to practice in Canada, in the province of Quebec, and must illustrate the proposed method of work.
- .5 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and indicate:
  - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.

- .2 Schedule of selective demolition.
- .3 Number and location of dumpsters.
- .4 Anticipated frequency of tipping.
- .5 Name and address of haulers, waste facilities and waste receiving organizations.

#### **1.4 TRANSPORT, STORAGE AND HANDLING**

- .1 Waste management and disposal.
  - .1 Sort the waste materials for recycling in accordance with Section 01 74 21 - *Construction demolition waste management and disposal.*

#### **1.5 SITE CONDITIONS**

- .1 Ensure Work is done in accordance with Section 01 35 43 - *Environmental Procedures.*
- .2 Take the necessary measures to preserve the environment in accordance with the Statement of Hazardous Materials.
- .3 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .4 Fires and burning of waste or materials is not permitted on site.
- .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
  - .1 Ensure proper disposal procedures of this type of materials are maintained throughout project.
- .6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction and as directed by Departmental Representative.
- .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .10 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.
- .11 Should materials resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in course of deconstruction, stop work, take preventative measures, and notify Departmental Representative.
  - .1 Do not proceed until written instructions have been received.

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**Part 2 PRODUCTS**

**2.1 EQUIPMENT**

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
- .2 Demonstrate that tools are being used in manner which allows for salvage of materials in best condition possible..

**Part 3 EXECUTION**

**3.1 PREPARATION**

- .1 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
- .3 Protection of in-place conditions:
  - .1 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping and adjacent grades to remain.
    - .1 Provide bracing and shoring as required.
    - .2 Repair damage caused by demolition as directed by Departmental Representative and assume responsibility for injury that may result from demolition work.
    - .3 Support affected structures and, if safety of structure being demolished, adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
    - .4 If the Departmental Representative find it necessary, set up reinforcement and shoring and carry out any necessary rework to prevent any movement or fail of the structures. Proceed without delay otherwise such work may be performed by the Departmental Representative at the expense of the Contractor.
    - .5 Protect surfaces from damage and make any necessary repairs or replacements to the satisfaction of the Departmental Representative without additional cost.
    - .6 Carry out the demolition work with tools or equipment to carry out the demolition without risk of fire, collapse or other adverse effect on the property.

- .2 Keep noise, dust and inconvenience to occupants to minimum
- .3 Provide dust screens, covers, railings, supports and other protection as required.
- .4 Protection of in-place conditions (zone 23):
  - .1 In addition to the requirements mentioned in section 3.1.3 of this specification, the Contractor must take the following specific measures for the protection of structures in zone 23:
    - .1 Provide temporary support for excavations and protection of excavation slopes when necessary.
    - .2 Demolition of the concrete slab, of variable thickness, under the masonry stones must involve measures to prevent the displacement, subsidence or any damage of adjacent structures to be preserved.
    - .3 The demolition work must be executed with tools or equipment that do not involved risk of subsidence or negative repercussion to the preservation of the wooden crib.
    - .4 Ensure the stability of the excavation slopes at all times to avoid erosion and scouring of the walls considering that water levels can be very variable.

### **3.2 DEMOLITION SALVAGE AND DISPOSAL**

- .1 Do demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and the requirements of CSA-S350.
- .2 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .3 Unless otherwise specified, masonry wall stones deemed to be in good condition by the Departmental Representative must be kept on the island and placed on pallets, stacked and positioned to minimize the size of the storage area.
- .4 Stored stones must be tagged and a recovered stones register must be kept by the Contractor and given to the Departmental Representative at the end of the work. The dimensions and a picture of each recovered stones must be included in the register.
- .5 Recovered stones should be handled with care, using lifting anchors to avoid breaking them.
- .6 Recovered stones must be cleaned and free of mortar.
- .7 All uncollected stones are considered rejected and must be disposed outside the site.
- .8 The recovered stones storage area must be fenced at the end of the works with a OMEGA fence of 2.4 meters high anchored to the ground. The fence will be retained by the Department after the work.

**3.3 PARTIAL DEMOLITION OF STRUCTURES**

- .1 Do demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and the requirements of CSA-S350.
- .2 The partial demolition work should be done as indicated in the demolition instructions and drawings.
- .3 Every concrete surface on which new concrete is to be installed must have a minimum surface profile, after demolition, corresponding to the CSP 7 configuration mentioned in the Technical Guideline document. No 0310.2R "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair" published by the International Concrete Repair Institute (ICRI). Profile evaluation is based on standard samples available from ICRI.
- .4 The Contractor must take precautions to preserve adjacent structures that must be kept.

**3.4 STOCKPILING**

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

**3.5 REMOVAL FROM SITE**

- .1 Dispose of materials not designated for alternate disposal in accordance with applicable regulations. Disposal facilities must be approved of and listed in waste reduction workplan. Do not deviate from disposal facilities listed in waste reduction workplan without prior written authorization from Departmental Representative.

**3.4 CLEANING**

- .1 Keep the site in good condition and clean for all the demolition work.
- .2 After demolition work, restore the areas that have been affected by the work to its original condition.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 01 33 00 - Submittal procedures
- .2 01 47 21 – Construction demolition waste management and disposal
- .3 03 20 00 – Concrete reinforcing
- .4 03 30 00 – Cast-in-place concrete
- .5 03 37 26 – Underwater placed concrete

### **1.2 PAYMENT AGREEMENT**

- .1 Measurement and payment
  - .1 Measurement procedures: in accordance to section 01 29 00 – Payment procedures

### **1.3 REFERENCE**

- .1 Canadien Standards Association (CSA International).
  - .1 CAN/CSA-A23.1/A23.2-F04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete;
  - .2 CAN/CSA-O86S1-F05 Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood ;
  - .3 CSA O121-FM1978 (C2003), Douglas Fir Plywood ;
  - .4 CSA O151-F04, Canadian Softwood Plywood ;
  - .5 CSA O153-FM1980 (C2003), Poplar Plywood ;
  - .6 CAN/CSA-O325.0-F92 (C2003), Construction Sheathing ;
  - .7 CSA O437 Série-F93 (C2006), Standards for OSB and Waferboard ;
  - .8 CSA S269.1-1975 (R2003), Falsework for Construction Purposes;
  - .9 CAN/CSA-S269.3-FM92 (C2003), Falsework for Construction Purposes.
- .2 Underwriters' Laboratories of Canada (ULC).
  - .1 CAN/ULC-S701-05 Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with section 01 33 00 – Submittal Procedures .
- .2 Submit shop drawings for formwork and falsework
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec, Canada.
  - .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and Comply with CAN/CSA-S269.3 for formwork drawings.
- .4 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms
- .5 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.
- .6 When slip forming and flying forms are used, submit details of equipment and procedures for review by Departmental Representative.

#### **1.5 DELIVERY, TRANSPORT AND HANDLING**

- .1 Waste Management and Disposal .
  - .1 Separate waste materials for reuse and recycling in accordance with section 01 74 21 - Construction demolition waste management and disposal.
  - .2 Place materials defined as hazardous or toxic in designated containers.
  - .3 Divert wood materials from landfill to a recycling facility as approved by Departmental Representative.
  - .4 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.
  - .5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Formwork materials .
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series, CSA-O153.

- .2 Form ties .
  - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface .
  - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs .
- .3 Form liner .
  - .1 Plywood: Douglas Fir to CSA O12 Canadian Softwood Plywood to CSA O151, Poplar to CSA O153.
  - .2 Waferboard: to CAN/CSA-O325.0.
- .4 Form release agent: biodegradable.
- .5 Form stripping agent: colourless mineral oil biodegradable free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm<sup>2</sup> /s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .6 Falsework materials: to CSA-S269.1.
- .7 Cementitious grout: to CSA A23.1/A23.2 and CSA A3000.

## **Part 3 EXECUTION**

### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Do not place shores and mud sills on frozen ground
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .7 Form release agent must be designed for preventing concrete adhesion. Before concreting, form release agent must be used as indicated at the data sheet. Do not let the release agent come into contact with rebars. Concreting level must be bounded by form top or moulding.
- .8. Before concreting, forms must be clean with a direct air jet, a high-pressure water jet or a vacuum for cleaning ice, snow and debris. Materials used to direct jet air must be equipped with an oil filter. Efficiency shall be demonstrated.
- .9 Align form joints and make watertight.
  - .1 Keep form joints to minimum.

- .10 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.
- .14 When slip forming and flying forms are used, submit details as indicated in PART 1 - SUBMITTALS.
- .15 Contractor shall inspect forms with a camera video before concreting. The camera video must be fixed on diver's helmet as directed by the Departmental Representative from a monitor.
- .16 Surplus concrete from concrete pumps must be placed in contained use facilities which are be disposed of an approval waste disposal facilities after the concrete hardens
- .17 Wastewater from concrete mixers must be placed in a watertight pond to prevent any release to the environment. Cleaning area must be located at a minimum of 30 meters of the water body and must be approval by the Departmental Representative.

### **3.2 REMOVAL AND RESHORING**

- .1 Remove formwork when concrete has reached 70 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .2 Back footing forms of concrete wall should be let in place if aren't in conflict with the backfill.
- .3 Forms are considered as removal when released or a part of these aren't in full contact with concrete.
- .4 Curing requirements must be applied as form removal has progressed in compliance with duration of curing period.
- .5 Following the removal of the formwork, exposed panel formwork joints shall be grinded.
- .6 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 33 00 - Submittal procedures
- .2 03 10 00 – Concrete forming and accessories
- .3 03 30 200 – Cast-in-place concrete
- .4 03 37 26 – Underwater placed concrete

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 Measurement procedures: in accordance with section 01 29 00 - Payment procedures.

**1.3 REFERENCES**

- .1 American Concrete Institute (ACI)
  - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
  - .1 ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - .2 ASTM A 143/A 143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - .3 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .4 ASTM A 775/A 775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International
  - .1 CSA-A23.1-09 A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A23.3-04 (R2010), Design of Concrete Structures.
  - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

- .4 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Grade.
      - .5 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
      - .6 Indicate sizes, spacings and locations of chairs, spacers and hangers.
    - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

#### **1.5 QUALITY ASSURANCE**

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
  - .1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
  - .2 Submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Store materials off ground in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: hot-dip galvanization to CAN/CSA-G164, grade 400W and meeting requirements of CSA-G30.18 (Carbon steel bars for concrete reinforcement).
- .3 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.
- .4 Deformed steel wire for concrete reinforcement: to ASTM A 82/A 82M.
- .5 Welded steel wire fabric: to ASTM A 185/A 185M.
  - .1 Provide in flat sheets only.
- .6 Welded deformed steel wire fabric: to ASTM A 82/A 82M.
  - .1 Provide in flat sheets only.
- .7 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .8 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m<sup>2</sup>.
  - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
  - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2 % by weight sodium dichromate or 0.2% chromic acid.
    - .1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
  - .3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5 % to 1 %.
    - .1 In this case, no restriction applies to temperature of solution.
- .9 Mechanical splices: subject to approval of Departmental Representative.
- .10 Bars for notches: plain round bars to CSA-G40.20/G40.21.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

- .1 SP-66 unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

### **2.3 SOURCE QUALITY CONTROL**

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Inform Departmental Representative of proposed source of material to be supplied.

## **Part 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Galvanizing to include chromate treatment.
  - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.
- .3 Bending to be performed mechanically and cold.

### **3.2 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

### **3.3 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Black steel reinforcement:
  - .1 expected use: all reinforcement of zone 23
- .3 Galvanized steel reinforcement:
  - .1 expected use: all reinforcement of zone 10, 11 and 24.
- .4 Reinforcing steel bars must be free of dirt, earth, paint, concrete splash from a previous pour, oil and must not be deformed or twisted. Reinforcing steel bars must be free of rust.

- .5 Minimal length of reinforcing steel bars in 6 meters where dimensions allow it.
- .6 Reinforcing steel bars must be solidly attached using steel wire ties in order to prevent the bars from moving during the concrete pour. Bars must be attached at every crossing if crossings are at a distance of 300 mm or more and at every two crossing if crossings are at a lesser distance. In the case of repairs, bars are fixed to every formwork rod.
- .7 Welding reinforcing steel bars is prohibited.
- .8 Existing reinforcing steel bars where ties have been distorted by demolition work must be set in their original position and fixed to every formwork rod in order to respect the required cover and a minimum distance of 25 mm in between bars and existing concrete to preserve.
- .9 Contractor must use plastic spacing shims at a maximum interval of 1200 mm center-to-center in order to maintain reinforcing steel bars at required distance of formwork, soil or existing concrete:
  - .1 Plastic circular spacers with center fixed to the reinforcing steel bars must be used to maintain in vertical position the layers of bars constituted of 15 M and 20 M bars.
  - .2 Plastic shims must be used to maintain in vertical position the layers of bars constituted of 25 M or greater dimension bars.
  - .3 Continuous shims with plastic covered wire and plastic tabs must be used to maintain in horizontal position the layer of bars closest to formwork, soil or existing concrete.
- .10 During reparation work, Contractor must, as requested by Departmental Representative, add reinforcing steel bars if the existing bars have been thinned by corrosion enough to decrease the structural capacity of the element. These additional bars must be installed with a minimum overlap of 600 mm. Contractor may have to demolish sound concrete in order to respect this requirement.
- .11 Anchors:
  - .1 Contractor must provide Departmental Representative at least 7 days prior to anchor drilling the data sheets for the anchors and grout or resin used.
  - .2 Anchors are performed where indicated on plans and specifications or set on site by Departmental Representative.
  - .3 The Contractor must set up 3 witness anchorages in the concrete per work zone requiring anchorages. He must carry out tests determining the tensile strength on these anchorages with the presence of de department representative. The tests are performed according to the requirements of the method described in ASTM standard E488 "Standard Test Methods for Strength of Anchors in Concrete Elements"; the testing load bearing being fixed at 10% of the total load with holding periods of 2 minutes at each bearing. If the tensile capacity of a control anchor does not meet the requirements, the Contractor shall modify the anchoring method and repeat the tests on new anchorages.

- .4 In the case of a repair with extra thickness and unless indicated otherwise, the anchor rod is a 15M reinforcing steel bar with a 100 mm hook. When the metal rod is threaded, it must be installed with a washer and nut.
- .5 Holes must be filled completely with cement grout or chemical anchoring product. A clean metal rod free of grease must be inserted to the bottom of the holes filed with cement grout or chemical anchoring product.
- .6 The amount of cement grout or chemical anchoring product inserted in the hole must be enough to fill entirely the gap located in between the rod and the concrete, to spill out of the hole when the rod is inserted.
- .7 The walls of the hole must be cleaned according to the recommendations of the anchors manufacturer. If an air jet is used, it must be equipped with a filter that captures oil. The efficiency of the filter has to be demonstrated prior to use.
- .8 Unless indicated otherwise on plans, the specifications of the holes to drill for the anchors with cement grout are the following:
  - .1 The diameter of the hole to drill must be 7 mm greater than the overall diameter of the rod to insert.
  - .2 The minimal depth is 300 mm.
  - .3 Holes on vertical faces must be drilled with a 15° angle relative to the horizontal. The orifice of the hole is at the summit.
- .9 Unless indicated otherwise on plans, the specifications of the holes to drill for the anchors with chemical resin are the following:
  - .1 The diameter of the hole to drill must be 3 mm greater than the overall diameter of the rod to insert.
  - .2 The minimal depth is 200 mm.
  - .3 Holes on vertical faces must be drilled with a 15° angle relative to the horizontal. The orifice of the hole is at the summit.
  - .4 For the anchors where the theoretical depth is 300 mm or more, Contractor must use an injection piston compatible with the type of resin and the diameter of the hole. The injection must begin at the bottom of the hole and progress to the exterior.
- .12 Contractor to perform a video inspection of the installed reinforcing steel bars and anchors. The camera must be fixed on the helmet of a diver and oriented as directed by Departmental Representative from a screen.
- .13 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .14 Maintain reinforcement coating integrity during concrete pour.

### **3.4 FIELD TOUCH-UP**

- .1 Touch up damaged and cut ends of galvanized reinforcing steel with a zinc-rich coating approved by Departmental Representative.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 33 00 - Submittal procedures
- .2 03 10 00 – Concrete forming and accessories
- .3 03 20 00 - Concrete reinforcing

**1.2 PAYMENT AGREEMENT**

- .1 Measurement and Payment
  - .1 Measurement procedures: in accordance with section 01 29 00 – Payment procedures

**1.3 REFERENCES**

- .1 Abbreviations and Acronyms.
  - .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
    - .1 Type GU or GUb - General use cement.
    - .2 Type MS or MSb - Moderate sulphate-resistant cement.
    - .3 Type MH or MHb - Moderate heat of hydration cement.
    - .4 Type HE or Heb - High early-strength cement.
    - .5 Type LH or LHb - Low heat of hydration cement.
    - .6 Type HS or HSb - High sulphate-resistant cement.
  - .2 Fly ash:
    - .1 Type F - with CaO content less than 8%.
    - .2 Type CI - with CaO content ranging from 8 to 20%.
    - .3 Type CH - with CaO greater than 20%.
  - .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 References.
  - .1 ASTM International.
    - .1 ASTM C 260-06 Standard Specification for Air-Entraining Admixtures for Concrete.
    - .2 ASTM C 309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    - .3 ASTM C 494/C 494M-08a, Standard Specification for Chemical Admixtures for Concrete.
    - .4 ASTM C 1017/C 1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

- .5 ASTM D 412-06ae1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .6 ASTM D 624-00 (2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .7 ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .8 ASTM D 1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
  - .2 CAN/CGSB-51.34-M86(C1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 CSA International.
  - .1 CSA A23.1/A23.2-F04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-F08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting prior to beginning concrete works.
  - .1 Ensure key personnel, Departmental Representative, speciality contractor - finishing, forming concrete producer and testing laboratories attend.
    - .1 Verify project requirements.

#### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide testing, inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by Departmental Representative

deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

- .5 Provide 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.

## **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.

## **1.7 TRANSPORT, ENTREPOSAGE ET MANUTENTION**

- .1 Delivery and Acceptance Requirements
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 PRODUCTS**

### **2.1 DESIGN CRITERIA**

- .1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

### **2.2 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

### **2.3 MATERIALS**

- .1 Hydraulic cement: Type GUb-SF to CSA A3001.
- .2 Water : to CSA A23.1.
- .3 Aggregates : to CSA A23.1/A23.2.
- .4 Admixtures :
  - .1 Air entraining admixture: to ASTM C 260;
  - .2 Chemical admixture: to ASTM C 494 et ASTM C 1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

### **2.4 MIXES**

- .1 Underwater (anti-washout) concrete in compliance with CSA A23.1/A23.2 and must satisfied the following criteria:
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 Workability : no superficial spots, lost adhesion of the mortar, color variations or segregation ;
  - .3 Durability and class of exposure : C-1;
  - .4 Compressive strength at 28 age: 35 MPa minimum;
  - .5 Intended use:
    - Repair with forming and extra thickness (zones 10, 11 et 24) ;
    - Repair with forming and no extra thickness (zone 11);
    - New footing (zone 11);
    - Massonery joints filling concrete (zone 22);

- Filling concrete (zone 23);
- Wall footing (zone 23).
- .6 Minimum weight binder: 450 kg/m<sup>3</sup>;
- .7 Type of binder : GUb-SF with 8 % minimum of silica fume;
- .8 Max. water/binder proportion : 0.42 ;
- .9 Coarse aggregate : 2.5-10 mm and fine aggregate proportion shall be between 45 et 55 %, based on total aggregate;
- .10 Air content : 6-9 %;
- .11 Slump : 200 mm ± 40 mm;
- .12 Max  $\bar{L}$  : 230 μm;
- .13 Max. permeability of the concrete to chloride ions : 1500 C;
- .14 Admixture : Anti washout admixture must comply to type S of ASTM C494 « Standard Specification for Chemical Admixtures for Concrete » and approval by Representative. Anti washout mixture is used to correct any defects or to facilitate placement. If inefficient, prior approval can be cancel by Departmental Representative during concreting.
- .2 Concrete with superplastifizer in compliance with CSA A23.1/A23.2 and must satisfied the following criteria::
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan ;
  - .2 Workability : no superficial spots, lost adhesion of the mortar, color variations or segregation ;
  - .3 Durability and class of exposure : C-1;
  - .4 Compressive strength at 28 age: 35 MPa minimum;
  - .5 Intended use :
    - Wall concrete base (zone 23).
    - Guard rails and fences Sonotube ;
  - .6 Minimum weight binder: 340 kg/m<sup>3</sup>;
  - .7 Type of binder : GUb-SF with 8 % minimum of silica fume;
  - .8 Water/binder proportion between: 0,38 à 0.42;
  - .9 Coarse aggregate : 5-20 mm;
  - .10 Air content : 5-8 %;
  - .11 Slump: 130 mm ± 30 mm;
  - .12 Max  $\bar{L}$  : 230 μm;
  - .13 Max. permeability of the concrete to chloride ions : 1000 C;
  - .14 Flaking – Max debris weight after 56 cycles : 0.50 kg/m<sup>2</sup>.3

- .3 Calcium Chloride or calcium chloride materials are forbidden.
- .4 According to requirements specified, submit a quality management plan to control concrete quality.
- .5 Qualification concrete supplier: concrete batching plant and materials in compliance with CSA A23.1.

### **Part 3 EXECUTION**

#### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work .
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .7 Protect previous Work from staining.
- .8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .9 Do not place load upon new concrete until authorized by Departmental Representative.
- .10 Cold weather concreting : to CSA A23.1/A23.2.

#### **3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Cold weather concreting : to CSA A23.1/A23.2.
- .3 Sleeves and inserts :
  - .1 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
  - .2 Confirm locations and sizes of sleeves and openings shown on drawings.

- .4 Anchor bolts:
  - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
  - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
    - .1 Formed holes: 100 mm minimum diameter.
    - .2 Drilled holes: to manufacturers' recommendations.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with shrinkage compensating grout.
  - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .5 Finishing and curing:
  - .1 Only water curing is allowed. Any other products are forbidden.
  - .2 Use procedures as reviewed by Departmental Representative to remove excess bleed water. Ensure surface is not damaged.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.1 Straightedge Method.

### **3.4 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7, 28 and 56 days.
  - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
- .5 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

- .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

### **3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Divert unused concrete materials from landfill to local quarry facility after receipt of written approval from Departmental Representative.
  - .2 Provide appropriate area on job site where concrete trucks and be safely washed.
  - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
  - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams
  - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
  - .7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 29 00 – Payment procedures
- .2 01 74 21 - Construction demolition waste management and disposal
- .3 03 30 00 - Cast-in-place concrete
- .4 03 20 00 - Concrete reinforcing

**1.2 MEASUREMENT PROCEDURES**

- .1 Measurement Procedures: in accordance with Section 01 29 00 - Payment Procedures.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

**1.4 DEFINITIONS**

- .1 Tremie concrete is placed underwater through tube called tremie pipe.
  - .1 Tremie pipe has a hopper at upper end and may be open ended or may have foot valve, plug or travelling plug to control flow of concrete.
  - .2 Concrete is placed in hopper and sufficient head of concrete is maintained in tremie pipe to provide desired rate of flow.
- .2 Pumped concrete method of placing concrete underwater uses concrete pump with discharge line used in similar manner to a tremie pipe.
- .3 Bottom-dump bucket method of placing concrete underwater requires use of bucket designed to discharge from bottom after it has contacted foundation or surface of previously placed concrete.
- .4 Bagged concrete method of placing underwater concrete consists of diver placing bags partially filled with dry concrete mix.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused concrete materials from landfill to local facility approved by Departmental Representative.

- .5 Divert chemical additive materials from landfill to official hazardous material collections site approved by Departmental Representative.
- .6 Do not dispose of unused chemical additive materials into sewer systems, into lakes, streams, onto ground or in any other location where it will pose health or environmental hazard.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Concrete materials: to Section 03 30 00 - Cast-in-Place Concrete.

### **2.2 MIXES**

- .1 Concrete mixes: to Section 03 30 00 - Cast-in-Place Concrete.

## **Part 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Where concrete must bond to existing surfaces, clean surfaces just prior to starting concrete placement.
  - .1 Use water jets, mechanical scrapers or other means, and when quantities of mud or rock cuttings are present, remove by air lift.

### **3.2 INSTALLATION**

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete and Section 03 20 00 - Concrete Reinforcement and to CAN/CSA-A23.1/A23.2. Testing for concrete to CAN/CSA-A23.1/A23.2, except where specified otherwise.
- .2 Concrete shall not be placed in water having a temperature below 5 °C.
- .3 Where concrete placement extends above water surface, protect concrete from direct contact with air at temperature below 5 °C for 7 days.
- .4 Place concrete in one continuous operation to full depth required.
  - .1 Supply complete equipment for every phase of operation.
  - .2 Provide sufficient supply of concrete to complete pour without interruption.
  - .3 The surface of concrete that emerges from the water must be rid of concrete laitance.
- .5 Tremie method.
  - .1 Provide water-tight tremie pipe sized to allow free flow of concrete. Diameter of tremie pipe to be minimum 200 mm and minimum eight times maximum size of coarse aggregate.
  - .2 Provide hopper at top of tremie pipe and means to raise and lower tremie

- pipe.
- .3 Provide plug or foot valve at bottom of tremie pipe to permit filling pipe with concrete initially.
  - .4 Provide minimum of one tremie pipe for every 30 m<sup>2</sup> of plan area and to maximum spacing of 6 m center to center. Do not move tremie pipes laterally through concrete.
  - .5 Start placement with tremie pipe full of concrete. Keep bottom of pipe buried minimum 300 mm in freshly placed concrete. Control rate of flow by varying depth of pipe bottom in concrete.
  - .6 If seal is lost, allowing water to enter pipe, withdraw pipe immediately. Refill pipe, and continue placing as specified.
  - .7 If tremie operation is interrupted so that horizontal construction joint has to be made, cut surface laitance by jetting, within 24 to 36 hours and remove loose material by pumping or air lifting before placing next lift.
  - .8 Do not place concrete in flowing water having current exceeding 3 m/min. If necessary, set up equipment to reduce the water flow. Do not vibrate, disturb or puddle concrete after placement.
- .6 Pumped concrete method.
- .1 Follow procedures as for tremie method in placing concrete using discharge line from concrete pump as tremie pipe.
  - .2 Pump discharge line to have minimum diameter of 125 mm.
- .7 Bottom-dump bucket method.
- .1 Fill bucket with concrete, cover top surface and lower slowly through water to prevent backwash.
  - .2 Discharge concrete only when bucket is in contact with surface on which concrete is to be deposited.
  - .3 Withdraw bucket until it is above concrete to maintain still water at point of discharge to approval of Departmental Representative.
  - .4 Do not place concrete in flowing water having current exceeding 3 m/min. If necessary, set up equipment to reduce the water flow. Do not vibrate, disturb or puddle concrete after placement.
- .8 Post-pour underwater inspection
- .1 Contractor to perform a video inspection of the concrete surfaces after removal of formwork. The camera must be fixed on the helmet of a diver and oriented as directed by Departmental Representative from a screen.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00 – Concrete forming and accessories
- .2 Section 03 20 00 – Concrete reinforcing

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM A 185/A 185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .2 ASTM A 775/A 775M-04a, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
  - .3 ASTM C 260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
  - .4 ASTM D 412-98a(2002)e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
  - .5 ASTM D 2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian Construction Documents Committee (CCDC) :
  - .1 CCDC 2-1994, Stipulated Price Contract .
- .3 Canadian Standards Association (CSA International) :
  - .1 CSA-A23.1/A23.2-F2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete .
  - .2 CAN3-A23.3-F04, Design of Concrete Structures .
  - .3 CSA-A23.4-F05, Precast Concrete - Materials and Construction .
  - .4 CAN/CSA-A3000-F03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .5 CAN/CSA-G30.18-FM92 (C2002), Billet-Steel Bars for Concrete Reinforcement .
  - .6 CAN/CSA-G40.20/G40.21-F2004, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel .
  - .7 CAN/CSA-G164-FM92(C2003), Hot Dip Galvanizing of Irregularly Shaped Articles .
  - .8 CAN/CSA-S6-F2005, Canadian Highway Bridge Design Code .
  - .9 CSA-W47.1-F 03, Certification of Companies for Fusion Welding for Steel.

- .10 CAN/CSA W48-F01(C2006), Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .11 CSA-W59-F03, Welded Steel Construction (Metal Arc Welding) (Metric version).
- .12 CSA-W186-FM1990 (C2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Ministère des Transports de la Mobilité Durable et de l'électrification des Transports (MTMDET) :
  - .1 CCDG 2018.

### **1.3 DESCRIPTION**

- .1 This section concerned the retaining wall (zone 23) which shall met the following requirements:
  - .1 The wall must be a prefabricated interlocking concrete blocks gravity wall without geogrid inclusions or anchorages in the embankment;
  - .2 Prefabricated interlocking concrete blocks are permitted to be solid or hollow. In the case of hollow concrete blocks, the blocks must be filled with concrete on site and not granular materials
  - .3 The top of the wall setback with respect to the bottom of the wall must be 204mm. The setback angle is therefore set at 4.25°.
  - .4 The manufacturer must take into account that a guardrail will be fixed to the crown block all along the wall, as shown on the plans;
  - .5 The joints between the blocks, at the change of axis, must not all be aligned;
  - .6 In the radius, no front opening is allowed between the blocks;
  - .7 No block sawing is allowed on site. Adjustments for the radius must be made at the factory and as shown on the shop drawings;
  - .8 The Contractor must take into account that a railing must be anchored in the crown piece.
- .2 This section of the specification also applies to the prefabricated New Jersey type wall in zone 23 and must comply with the following requirements:
  - .1 New Jersey precasted walls supplied by the Contractor may be used but the concrete must be sound.

#### **1.4 DESIGN REQUIREMENTS**

- .1 The precast wall in zone 23 must comply with the following design requirements:
  - .1 Design precast elements to CSA-A23.4 to carry handling constraints.
  - .2 Design precast elements to carry loads specified by Departmental Representative, in accordance with applicable codes.
  - .3 Precast elements must be designed to carry the impacts of ice and the wall designed for installation in the marine environment.
  - .4 The supplier must increase shear strength between prefabricated elements by a factor of 2 to take into account poorly defined ice-induced forces. The copying blocks must be mechanically anchored, not just by applying surface glue.
  - .5 Design connections/attachments of precast elements to load/forces specified by Departmental Representative.
  - .6 Design the prefabricated elements considering a design overload of 18 kPa at the head of the wall.
  - .7 design concrete copings and anchors as a function of loads and forces of the railing to be fixed on the latter.
  - .8 Provide detailed calculations and design drawings for typical precast elements and connections as described in Section 01 33 00 - Submittal Procedures.

#### **1.5 PERFORMANCE REQUIREMENTS**

- .1 Tolerance of precast elements to CSA-A23.4.

#### **1.6 ACTION AND INFORMATIONAL SUBMITTAL**

- .1 Submittals in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Submit Material Safety Data Sheets that comply with the Workplace Hazardous Materials Information System (WHMIS).
- .3 The Contractor must identify the supplier of the zone 23 wall and the manufacturing plant at least 4 weeks prior to the pre-manufacturing meeting.
- .4 Submit shop drawings of zone 23 wall prepared in accordance with CSA-A23.3 and include following items:
  - .1 Design calculations for items designed by manufacturer.
  - .2 Details of concrete elements, reinforcement and their connections.
  - .3 The equipment of the entire wall showing the location of joints, blocks and aesthetic appearance;
  - .4 The identification of the elements must be indicated on shop drawings;
  - .5 Finishing schedules ;
  - .6 Methods of handling and erection;
  - .7 Openings, sleeves, inserts and related reinforcement.

- .5 Submit 2 copies of detailed calculations and design drawings for typical precast elements of zone 23 wall and connections for review by Departmental Representative.
- .6 Submit shop drawings with the seal and signature of a qualified or licensed professional engineer to practice in Canada, in the province of Quebec.
- .7 Submit samples in accordance with Section 01 33 00 - Submittal Procedures and provide sample and sample number of each finish used on project to Departmental Representative.
- .8 The Contractor must provide the Departmental Representative, at least 2 weeks prior to the meeting, the following documents:
  - .1 The certificate of qualification of the plant in accordance with CAN / CSA-A23.4 "Precast Concrete: Constituents and Workmanship" ;
  - .2 The qualification certificate "Concrete Testing Technician - Level 1", awarded by the American Concrete Institute (ACI), of the person assigned to the preclearing of the concrete and the preparation of the test specimens necessary to establish the the moment of removal of the formwork and the end of the cure;
  - .3 The calibration certificate of the concrete press used at the factory. The latter must be less than 12 months old.

## **1.7 QUALITY ASSURANCE**

- .1 Quality Control Plan: submit to the Departmental Representative, as indicated in the CONTROL section of PART 3, a written report showing compliance of the concrete products supplied with the performance requirements set out in PART 2 - PRODUCTS.

## **1.8 QUALIFICATIONS**

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate category according to CSA-A23.4
- .2 Precast concrete manufacturer certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting Bid and to verify as part of Bid that plant has current certification in appropriate category, Structural.
- .3 Only precast elements fabricated in certified plants acceptable and plant certification maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

## **1.9 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.
- .2 To prevent stains, make sure that the corners of the elements do not come into contact with soil.
- .3 Waste management and disposal.

- .4 Separate waste materials in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal.

### **1.10 WARRANTY**

- .1 Warrants precast elements not to spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, in accordance with subsection GC32.1 of General Conditions "C", but warranty of 12 months extended to 24 months.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Hydraulic cement : type GU to CAN/CSA-A3001.
- .2 Supplementary cementing materials : with minimum 20% Type F CI CH fly ash replacement N GGBFS, by mass of total CAN/CSA A3001.
- .3 Water: to [CSA-A23.1/A23.2]
- .4 Reinforcing steel: to CAN/CSA-G30.18.
- .5 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .6 Forms: to CSA-A23.4.
- .7 Anchors and supports: to CAN/CSA-G40.21 Type 300 W.
- .8 Air entrainment admixtures: to ASTM C 260.

### **2.2 MIXES**

- .1 Concrete
  - .1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CAN/CSA-A23.1/A23.2.
    - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance of the article CONTROLE, of PART 3.
    - .2 Provide concrete mix to meet following plastic state requirements:
      - .1 Maximum water / binder ratio : 0.45;
      - .2 Air content : 5 à 8%;
      - .3 Placeability (slump): 150 mm ± 30;
      - .4 Workability: free of surface blemishes loss of mortar colour variations segregation.
    - .3 Provide concrete mix to meet following hard state requirements.
      - .1 Durability and class of exposure : C-1;
      - .2 Minimum compressive strength at 28 days age: 35 MPa.
    - .4 Submit a quality management plan to ensure quality control of the concrete based on specified performance requirements.

- .5 Certification of the concrete supplier.
- .2 Grout
  - .1 Cement grout : Portland GUB type.
  - .2 Minimum compressive strength : 35 MPa.
  - .3 Shrinkage compensating grout : to section 03 30 00 - Cast-in-Place Concrete .

### **2.3 MANUFACTURED UNITS**

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.
- .3 Precast wall elements (zone 23) must be in compliance with following requirements :
  - .1 Precast block must be minimum 425 mm high and 1000 mm wide.
  - .2 Hardwares parts required for the handling of precasted elements must be provided.
  - .3 Permanent Hardwares must be galvanized.
- .4 The precasted elements of the New Jersey in Zone 23 must meet the following requirements:
  - .1 Precast elements must have a minimum height of 800 mm and a minimum width of 600 mm.
  - .2 Prefabricated parts must be designed to fit together end-to-end with an I-lock system.

### **2.4 FINISHES**

- .1 Precast wall (zone 23) shall comply to following requirements:
  - .1 Visible surfaces finish must be textured as a natural stone block.
  - .2 Non-visible surfaces finish to standard grade to CSA-A23.4.
  - .3 Finish must be approval by Departmental Representative
- .2 Prefabricated new-jersey type anchor (zone 23) must be in compliance with following requirements:
  - .1 Non-visible finish units to standard grade to CSA-A23.4.

### **2.5 SOURCE QUALITY**

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4.
- .2 Provide records from in-house quality control programme based upon plant certification requirements to Departmental Representative for inspection and review.
- .3 Provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

- .4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Departmental Representative for review upon request.

### **Part 3 EXECUTION**

#### **3.1 ERECTION**

- .1 At least 7 days before starting precast concrete work, a meeting shall be planned with Contractor, Manufacturer and Departmental Representative. When data concrete sheet has been accepted and workshop plans have been stamped for production. For these elements and at least 4 weeks before this meeting, Contractor must inform Departmental Representative of manufacturer identity and manufacturing plant.
- .2 Do precast concrete work in accordance with CSA-A23.4, CSA-A23.3 and CAN/CSA-S6.
- .3 Erect precast elements within allowable tolerances as indicated.
- .4 Non-cumulative erection tolerances in accordance with CSA-A23-4. .
- .5 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .6 Grout underside of unit bearing plates with shrinkage compensating grout.
- .7 Fasten precast units in place as indicated on approved shop drawings.

#### **3.2 VERIFICATION**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 - Products, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

#### **3.3 CLEANING**

- .1 Use cleaning methods as reviewed by Departmental Representative before cleaning soiled precast concrete surfaces.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 not used

**1.2 GENERALITY**

- .1 For estimation purposes, estimate 20% of existing stones that are in good condition and to be reused for the development and development of the old lock. These stones must be subject to the precautions listed in this specifications section.

**1.3 DOCUMENTS/ÉCHANTILLONS À SOUMETTRE POUR APPROBATION / INFORMATION**

- .1 Submit work plans and temporary shoring required to dismantle the structure. The plans must be signed and sealed by an engineer member of the OIQ and submitted for review to the Departmental Representative. This engineer must be engaged and paid by the Contractor.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Protect the stones considered in good condition and contribute to their conservation.
- .2 Unless otherwise specified, masonry wall stones deemed to be in good condition by the Departmental Representative must be kept on the island and placed on pallets, stacked and positioned to minimize the size of the storage area.
- .3 No stone items should be considered rejected without the approval of the Departmental Representative.
- .4 Stored stones must be tagged and a recovered stones register must be kept by the Contractor and given to the Departmental Representative at the end of the work. The dimensions and a picture of each recovered stones must be included in the register. A stone register must be maintained by the Contractor as stipulated in Section 01 78 00 - Documents and Deliverables upon Completion.

**Part 2 PRODUCTS**

**2.1 NOT USED**

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Examine masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.

### **3.2 PROTECTION**

- .1 Prevent damage to retaining structures and its walls which are to remain. Repair the damage incurred.
- .2 Protect surrounding components from damage during work.

### **3.3 STRUCTURAL SUPPORT**

- .1 Construct shoring and cradling, and other temporary framing work needed to support structure, or parts of it, during removal operations and in anticipation of resetting, if structure is not to be completely dismantled, according to approved shop drawings as describe in section 1.3.

### **3.4 DISMANTLING AND MOVING STONES**

- .1 For stones to be recovered, remove mortar joints to loosen stones, use approved methods that do not cause damage to stones or other architectural features. Thoroughly remove the peripheral mortar joints from the stones by making a clearance saw stroke. If the stone is still solid in the wall, make deconsolidation holes 150mm deep using a drill bit in the peripheral seal and every 50mm without damaging the adjacent stones. If the stone is not deconsolidated after drilling, proceed with a Arbotech parallel blade saw. Remove the stones.
- .2 Remove all loose debris and deteriorated mortar from the stone substrate
- .3 Do not use circular grinding wheels, saws, pneumatic chisels, or metal tools that put pressure on the edges of the stone. Obtain approval from the Departmental Representative for the use of mechanical tools before the beginning of the work.

### **3.5 HANDLING**

- .1 The Contractor must obtain approval of its handling and transportation strategy by the Departmental Representative prior to the dismantling.
- .2 Usage of Lewis bolts for handling stone is not permitted.
- .3 Place stones removed on wooden surfaces during handling, avoiding contact with metal.
- .4 When stones are lowered to ground, place directly on wooden platform used for transport or storage.
- .5 Transport and keep stones on wooden platforms.
- .6 Ensure that sharp edges of stones do not come into contact with hard objects.

### **3.6 TEMPORARY STORAGE STAGING AREA**

- .1 Place stones in designated area of site for cleaning, detailed inspection and for final marking, before storage.
- .2 Make stones accessible and retrievable when required.

### **3.7 CLEANING**

- .1 Do cleaning operations at above freezing temperature.
  1. After cleaning, protect wet stones against freezing until dry.

- .2 Clean stones by wet scrubbing with vegetable fibre brush unless otherwise instructed by Departmental Representative.
  - .1 Do not use high pressure water jet.
- .3 Remove excess mortar using hand tools.

### **3.8 FINAL STORAGE**

- .1 Store the stones at the location indicated on the plans on the island.
- .2 The stones must be stacked up to a height of maximum 2 meters.
- .3 The final storage area must be confined by a permanent "OMEGA" construction site fence that will be left to the Department.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 33 00 – Submittal procedures .

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A 269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
  - .1 CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CSA S16-09, Design of Steel Structures.
  - .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5 CSA W59-M03 (R2008), Welded Steel Construction (Metal Arc Welding) Metric.
- .3 Green Seal Environmental Standards (GS)
  - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - édition courante.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for the protection plates of the dock pier head and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
    - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
  - .4 Submit a guardrail layout plan for approval by the Supervisor's Representative prior to proceeding with the exploration wells required to locate the wall anchors in the embankment.

#### **1.4 QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Steel plates (zones 3 and 23): to CSA G40.20/G40.21, Grade 300W.
- .2 Bolts and anchor bolts: to ASTM A 307.
- .3 Anchorage rod: to ASTM A307 galvanized.
- .4 Grout: non-shrink, non-metallic, fluid and resistance of 15 MPa after 24 hours.
- .5 Chemical anchorage: ASTM E488.
- .6 Guardrails (zones 22, 23 and 24): grade 300W, according to CSA G40.20 / 40.21 galvanized and painted.
- .7 Welding materials: to CSA W59.
- .8 Welding electrodes: to CSA W48 series standards.

## **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 The Contractor must provide 5% more standard nuts and 5% more vandal nuts to the Department as spares.

## **2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.
- .2 Railing Paint: "Black Gloss" # 5279 rust-oleum, Series 5200 or equivalent approved. Cleaning with a suitable solvent is required before painting the galvanized elements.
- .3 The railings must be galvanized and painted.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental representative.
  - .2 Inform Departmental representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental representative.

### **3.2 ERECTION**

- .1 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .2 Provide suitable means of anchorage acceptable to Departmental representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal procedures
- .2 Section 31 23 33.01 – Excavating, trenching and backfilling.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D 4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

**1.3 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling.
- .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert unused granular materials from landfill to local quarry as approved by Departmental Representative.

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Natural sand.
  - .2 Manufactured sand.
  - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
  - .3 Light weight aggregate, including slag and expanded shale.
- .5 Cushion and coating materials must satisfy the requirements of NQ-2560, Part III: Aggregates used as a cushion, coating, separation layer and filtering medium.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
- .2 If, in opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Departmental Representative 4 weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## **Part 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Handling
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .2 Stockpiling
  - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 h of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
  - .1 Max [1.5] m for coarse aggregate and base course materials.
  - .2 Max [1.5] m for fine aggregate and sub-base materials.
  - .3 Max [1.5] m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### **3.2 CLEANING**

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 01 33 00 – Submittal procedures
- .2 01 35 43 – Environmental procedures
- .3 01 35 13.43 – Special procedures for contaminated sites
- .4 31 05 16 - Aggregate materials

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-05, Standard Test Method for Sieve Analysis of Fine and Course Aggregates.
  - .3 ASTM D 422-63, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D 698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D 1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D 4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .3 U.S. Environmental Protection Agency (EPA)/Office of Water
- .4 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.3 DEFINITIONS**

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment (0.95 to 1.15 m<sup>3</sup> bucket). Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 mm in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.
- .9 Sediment: Set of particles suspended in the water that ends up settling on the seabed under gravity, often in layers or successive strata.

### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority and location plan of relocated and abandoned services, as required.
- .2 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

### **1.5 QUALITY ASSURANCE**

- .1 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Keep design and supporting data on site.
- .4 Engage services of qualified professional Engineer who is registered or licensed in Province of Quebec, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .5 Health and Safety Requirements.
  - .1 Take the necessary health and safety measures in accordance with Section 01 35 29.06 - Health and Safety.

### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert excess aggregate materials from landfill to local quarry for reuse as directed by Departmental Representative.

### **1.7 EXISTING CONDITIONS**

- .1 Examine soil report available in Appendix of Specifications.
- .2 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

- .5 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.
- .6 Confirm locations of buried utilities by careful test excavations.
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
- .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
- .9 Record location of maintained, re-routed and abandoned underground lines.
- .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative and in accordance with Section 32 01 90.33 - Tree and Shrub Preservation.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Fill materials properties to Section 31 05 16 - *Aggregate Materials* and the following requirements:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 In addition to geotechnical requirements, backfill or borrow materials from outside the site and used on the site must comply with Level A of the MDDELCC Soil Protection and Contaminated Sites Reclamation Criteria.
  - .3 Gradations to be within limits specified when tested to BNQ 2560-114 for materials type MG20 and MG56, such as:

**Materials type - MG20**

<b>SIEVE (mm)</b>	<b>% PASSING</b>
31,5 mm	100
20 mm	90 – 100
14 mm	68 – 93
5 mm	35 – 60
1,25 mm	15 – 38
315 µm	5 – 17
80 µm	2,0 – 7,0

**Materials type – MG56**

<b>SIEVE (mm)</b>	<b>% PASSING</b>
80 mm	100
56 mm	82 - 100
31,5 mm	55 - 85
5 mm	25 - 50
1,25 mm	11 - 30
315 µm	4 - 18
80 µm	2,0 - 7,0

- .4 Class B borrow material: Compactible material approved by the Departmental Representative from sources other than excavation material and free from organic matter and harmful material.
- .5 100 - 200 mm rockfill: average diameter to be greater or equal to 150 mm.
- .6 500 - 800 mm average diameter to be greater or equal to 650 mm.
- .7 50 - 100 mm levelling materials: average diameter to be greater or equal to 75 mm.
- .8 Clean crushed stone: 19 mm diameter.
- .9 Geotextiles: to Section 31 32 19.01 - Geotextiles.

**Part 3 EXECUTION**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during

construction until permanent vegetation has been established.

- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

### **3.3 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with Section 01 56 00 - *Temporary Barriers and Enclosures* and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

### **3.4 STOCKPILING**

- .1 In accordance with Section 31 05 16 - Aggregates.

### **3.5 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### **3.6 EXCAVATION**

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.

- .2 Excavate to lines, grades, elevations and dimensions as indicated by Departmental Representative.
- .3 Remove obstructions encountered during excavation in accordance with Section 02 41 16 - Structure demolition.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Excavated and stockpiled materials must respect the loading limits indicated on the plans.
- .9 Restrict vehicle operations directly adjacent to open trenches.
- .10 Dispose of surplus and unsuitable excavated material in approved location.
- .11 Do not obstruct flow of surface drainage or natural watercourses.
- .12 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .13 Notify Departmental Representative when bottom of excavation is reached.
- .14 Obtain Departmental Representative approval of completed excavation.
- .15 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .17 Install geotextiles in accordance to Section 31 32 19.01 - *Geotextiles*.

### **3.7 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698 and ASTM D 1557.
  - .1 Backfilling of the excavation for the retaining wall of zone 23:
    - .1 First, reuse excavated materials, after characterization, in accordance with section 01 35 43E Special Procedures Contaminated Sites;
    - .2 If excavated materials is contaminated as specified in Section 01

35 43F Contaminated Sites Special Procedures, use class B (provisional) backfill. Class B backfill must meet the specifications outlined in the 31 05 16F Aggregates section. The source of borrowing and the granulometry of materials must be submitted to the Departmental Representative for approval of Class B borrow material.

- .2 Place unshrinkable fill in areas as indicated.

### **3.8 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 72 hours after placing of concrete.

### **3.12 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 01 33 00 – Submittal procedures
- .2 31 05 16 – Aggregate materials
- .3 31 23 33.01 – Excavating, trenching and backfilling

### **1.2 GENERALITY**

- .1 This section includes requirements for the supply and installation of geotextiles for the construction of protective, filtration or drainage structures, retaining walls.

### **1.3 MEASUREMENT PROCEDURES**

- .1 Geotextiles are not measured for payment purposes. They will be included in the price of the different items.

### **1.4 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .2 ASTM D 4595-86 (2001), Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .3 ASTM D 4716-01, Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
  - .4 ASTM D 4751-99a, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-4.2 No. 11.2-M89 (April 1997), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
  - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
    - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
    - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
    - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
    - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
    - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative following samples at least 4 weeks prior to beginning Work.
  - .1 Minimum 2 m length of standard width membrane.

### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

### **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

## **Part 2 PRODUCTS**

### **2.1 MATERIAL**

- .1 Geotextile: non-woven synthetic fiber fabric, supplied in rolls.
  - .1 width: minimum 3.5 m.
  - .2 length: minimum 50 m.
  - .3 Composed of 85% by mass of polypropylene with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure.
- .2 Physical properties:
  - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 3.5 mm.
  - .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 500 g/m<sup>2</sup>.
  - .3 Tensile strength and elongation at break: to CAN/CGSB-148.1, No.7.3.
    - .1 Tensile strength: minimum 550 N, wet condition.
    - .2 Elongation at break: minimum 70 %.
  - .4 Bursting strength: to CAN/CGSB-148.1, No.6.1 minimum 3500 kPa, wet condition.

- .3 Hydraulic properties:
  - .1 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10, 150 micrometers.
- .4 Anchors and anchor washers: to CAN / CSA-G40.21, grade 300W, hot dip galvanized and zinc-plated to a minimum of 600 g / m<sup>2</sup>, to CAN / CSA G164.

### **Part 3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 For geotextile provided on existing crib in zone 23, join successive strips of geotextile by sewing.
- .5 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

#### **3.2 CLEANING**

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

#### **3.3 PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal procedure
- .2 Section 05 50 00 – Metal fabrications

**1.2 MEASUREMENT PROCEDURES**

- .1 Measure sheet pile as mentioned in Section 01 29 00 – Payment procedures.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A 6/A 6M-02b, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
  - .2 ASTM A 307-02, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .3 ASTM A 615/A 615M-01b, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - .4 ASTM A 1011/A 1011M-02, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .2 Canadian Standards Association (CSA International).
  - .1 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
  - .3 CSA W47.1S1-FM1989(C1998), Supplement No.1-1989 to W47.1-1983, Certification of Companies for Fusion Welding of Steel Structures.
  - .4 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric Version).
  - .5 CSA W59S1-FM1989 (C1998), Supplement No.1-M1989, Steel Fixed Offshore Structures, to W59-M1989, Welded Steel Construction (Metal Arc Welding).

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for the following items:
  - .1 Steel dowels;
  - .2 Rock anchoring guide;
  - .3 Rock anchoring rod;

- .4 Steel sheet piling and capping;
  - .5 Connections;
  - .6 every required parts for the implementation of the sheet piles including their temporary support.
- .3 The Contractor shall provide the use of corner connectors and special corner sheet piles, as required, for the ends connections.
  - .4 If the contractor decides to do the concreting in several stages, he must provide the necessary connections on the sheet piles. in this case, the elements must be indicated on the shop drawings.
  - .5 Submit the work method and execution plan for the sheet pile implementation at the kick-off meeting. Details shall indicate the jigs, braces, placement order and sheet piling schedule and the number of sheet piles per section.
  - .6 The final sheet pile wall layout plan must be submitted and approved by the Departmental Representative prior to the start of sheet pile work and / or anchor drilling.
  - .7 At least 2 weeks prior to fabrication, submit to Departmental Representative, 2 copies of steel producer certificates in accordance with ASTM A 1011/A 1011M and mill test reports in accordance with CAN/CSA-G40.20/G40.
  - .8 Provide Departmental Representative with copy of certification for fusion welding in accordance with CSA W47.1.

#### **1.5 QUALITY ASSURANCE**

- .1 Inspection and testing of steel sheet piling material will be carried out by testing laboratory designated by Departmental Representative at any time during course of Work.
- .2 Materials inspected or tested by Departmental Representative which fail to meet contract requirements will be rejected.
- .3 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, Contractor to pay costs for additional tests or inspections. Departmental Representative to approve corrected work.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.
- .2 Store sheet piling on level ground or provide supports so that sheet piling is level when stored.
  - .1 Provide blocking at spacing not exceeding 5 m so that there is no excessive sagging in piling.
  - .2 Overhang at ends not to exceed 0.5 m.
  - .3 Block between lifts directly above blocking in lower lift.
- .3 If material is stock-piled on structure, ensure that structure is not overloaded.

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

## **Part 2 PRODUCT**

### **2.1 MATERIALS**

- .1 Steel sheet piles: to CAN/CSA-G40.21, including chemical and mechanical requirements grade 350W, and following:
  - .1 Minimum effective section modulus of 772 cm<sup>3</sup> per metre of wall;
  - .2 Minimum flange thickness of 6,4 mm;
  - .3 Unit length of 723 mm;
  - .4 Unit maximum depth (or heigh): 254 mm.
- .3 Structural steel for connections, capping and angles for sheet piles ends connections: to CAN/CSA-G40.21, including chemical and mechanical requirements, Grade 350W.
- .4 Structural steel for walers, bearing plates, walers splices, capping channels, support angles and miscellaneous steel: to CAN/CSA-G40.21, including chemical and mechanical requirements, Grade 300W or contractor's conception.
- .5 Tie rods, sleeve nuts and turnbuckles:
  - .1 Tie rods: to ASTM A 615, Grade 75 ksi;
  - .2 Sleeve nuts: to have load capacity in excess of capacity of tie rod;
  - .3 Preassemble, mark and test tie rod assemblies in shop. Align threaded connection to following tolerances at sleeve nut or connector sleeve: 1/80 of normal rod diameter, deviation of centre line, 1 in 160.
- .6 Studs welded to sheet piles:
  - .1 To ASTM A 108, grade 1015.
  - .2 Low carbon steel.
  - .3 Minimum tension capacity, ultimate: 410 MPa.
- .7 Nuts and bolts: hexagon nuts, bolts, and washers: to ASTM A 307.
- .8 Backfill material: to Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **2.2 SOURCE QUALITY CONTROL: COLD FORMED STEEL SHEET PILING**

- .1 Provide results of tension tests of sheet piling material to be used on project as follows
  - .1 One tension test from each heat for quantities of finished material less than 50 tonnes.
  - .2 Two tension tests from each heat for quantities of finished material exceeding 50 tonnes.

- .2 Tension tests in accordance with [CAN/CSA-G40.20/G40.21.
- .3 Provide results of bend tests of sheet piling material to be used on project as follows:
  - .1 Bend tests in accordance with ASTM A 6/A 6M, with following amendments:
    - .1 S14.1 Bend tests to be performed with material in condition as used in cold forming operation. Three tests to be made from each heat and each thickness of material produced. Bend test specimens to be taken from edge of each coil. Longitudinal axis of specimen to be transverse to coil rolling direction.
    - .2 S14.1.1 - Except as provided below, bend test specimens to have minimum width to thickness ratio of 8, with both edges parallel throughout section in which bending occurs, and is maintained.
    - .3 S14.2 - Minor surface separations less than 0.8 mm in depth related to superficial steel surface or subsurface discontinuities to not cause rejection. Surface separations in excess of 0.8 mm depth and/or cracks normal to metal surface to cause rejection.

### **Part 3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Do welding in accordance with CSA W59 and CSA W59S1, except where specified otherwise.
- .2 Do not begin pile installation until required quality control tests have been completed and test results approved by Departmental Representative.
- .3 Submit the final sheet pile layout for approval by the Departmental Representative before implementation.
- .4 Submit full details of method and sequence of installation of piling to Departmental Representative for approval prior to start of pile installation work. Details must include templates, bracing, setting and driving sequence and number of piles in panels for driving.
- .5 When installing sheet piles in bulkhead wall, use following procedure :
  - .1 Implant sheet piles so that they fit into metal rods anchored to the rock, regardless of the order of placement of anchor rods and sheet piling;
  - .2 Provide temporary templates or bracing to hold piles in alignment during setting and driving;
  - .3 Use sheet pile protection devices when driving according to the Contractor's method (driving cap, etc.);
  - .4 Begin the driving of sheet piles from upstream to downstream.
  - .5 Drive piles two at a time. Drive first double pile to full depth, then place panel of five to eight double sheet piles in templates and secure last (end) double pile in location to prevent spreading of piles in panel.;

- .6 Drive end double pile in panel sufficiently deep into ground to ensure that it will remain plumb, then, drive remaining double piles in panel to full depth beginning with double pile next to end double pile and finishing with double pile next to double pile first driven;
- .7 After one panel has been driven, place and drive succeeding panels in similar manner. Complete the driving of end double pile of first panel after double piles of second panel have been driven.
- .6 When installation is complete, face of wall at top of sheet piles to be within 75 mm of location as indicated and deviation from vertical not to exceed 1 in 100.
- .7 Use a temporary support system, designed by the Contractor, to stabilize the bulkhead wall against the hydrostatic pressures that will be generated by the drying of the excavation areas, by the thrust of the current and during the first concrete filling placement. During the work, any modification to the initial temporary support system installed by the Contractor must be the subject of a calculation note signed by the Contractor's engineer.

### **3.2 OBSTRUCTIONS**

- .1 If obstruction encountered during driving, leave obstructed pile and proceed to drive remaining piles. Return and attempt to complete driving of obstructed pile later.
- .2 Advise Departmental Representative immediately if impossible to drive pile to full penetration, and obtain direction from Departmental Representative on further steps required to complete Work.

### **3.3 HOLES**

- .1 Patch holes in sheet pile wall, except where permanent holes are indicated.
  - .1 Use 6.4 mm thick plate of material equal to that of piling to patch holes and overlap not less than hole diameter.
  - .2 Weld to develop full strength of plate.
- .2 Drill any required holes in piling. Do not use flame cutting without permission of Departmental Representative.

### **3.4 CUTTING**

- .1 When flame cutting tops of piles, and flame cutting holes in piles approved by Departmental Representative, use following procedure:
  - .1 When air temperature is above 0 degrees C, no pre-heat is necessary.
  - .2 Use torch guiding device to ensure smooth round holes or straight edges.
  - .3 Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5 mm.

### **3.5 SPLICING**

- .1 No splicing is allowed.

### **3.6 ANCHORAGE SYSTEM**

- .1 Do not place backfill behind anchored bulkhead [or remove material from in front of bulkhead] until piles have been completely driven, adjusted and secured in final position by anchorage system.
- .2 Fit and adjust tie rod systems so that connections at waling and anchor end of tie rods are tight before backfilling.

### **3.7 TOE PINNING**

- .1 Drive sheet piling at pinned sections to bedrock hard pan contact.
- .2 Drilling rock holes for anchor placement: Use a drill guide pipe to confine drilling.
- .3 Pin sheet piling at toe in locations as indicated. Use pipe sleeves for alignment.
- .4 Clean the hole by suction or other equivalent method.
- .5 Secure pins with grout by injecting it through the injection pipe attached to the anchor rod from the bottom of the hole with minimal pressure. The grout must completely fill the guide pipe up to the level to ensure the quality of the injection. The grout must have a compressive strength of 7 MPa at 24 hours.

### **3.8 TOE TRENCHING**

- .1 Only debris that may conflict with anchor plugs or sheet pile curtain is excavated.
- .2 Do not remove loose or cracked rock that is likely to support adjacent wood cribs.
- .3 Use techniques that will allow piling of sheet piles to rock.

### **3.9 BACKFILLING**

- .1 Backfill with Underwater placed concrete in accordance with Section 03 37 26 – Underwater placed concrete.
- .2 Protect piling tie rods and anchorage systems from damage or displacement during backfilling operations.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 01 33 00 – Submittal procedures

**1.2 REFERENCES**

- .1 ASTM International.
  - .1 ASTM A 1064/A 1064M-[13], Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .2 Canada Green Building Council (CaGBC)
  - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
  - .2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
  - .3 LEED Canada 2009 for Design and Construction-[2010], LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.
  - .4 LEED Canada for Existing Buildings, Operations and Maintenance-[2009], LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.
- .3 CSA Group.
  - .1 CSA G30.18-[09], Carbon Steel Bars for Concrete Reinforcement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .6 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .2 Fertilizers Act (R.S. 1985, c. F-10).
  - .3 Fertilizers Regulations (C.R.C., c. 666).
  - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

**1.3 DEFINITIONS**

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Contractor's responsibility.
- .3 Submit WHMIS MSDS.

**1.5 QUALITY ASSURANCE**

- .1 Health and Safety.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Refer to Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

**1.7 SCHEDULING**

- .1 Refer to Section 01 32 16.07 - Construction Progress Schedules - Bar (GANNT) Chart.

**1.8 MAINTENANCE DURING WARRANTY PERIOD**

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
  - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
  - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative prior to application.
    - .1 Do not use pesticides near water, within 3 meters of the high water mark.
    - .2 If pesticides are required elsewhere on the work site, a pesticide treatment plan must be submitted for approval by the Parks Canada process.
  - .3 Apply fertilizer in early spring at rate of 0.025 kg of nitrogen/m<sup>2</sup> or at manufacturer's suggested rate.
  - .4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through alternative disposal.

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**Part 2 PRODUCTS**

**2.1 SUSTAINABLE REQUIREMENTS**

- .1 Not used.

**2.2 MATERIALS**

- .1 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded minimum particle size: 5 mm.
- .2 Fertilizer:
  - .1 To Canada Fertilizer Act and Fertilizers Regulations.
  - .2 Complete, commercial, slow release with 35 % of nitrogen content in water-insoluble form.
- .3 Anti-desiccant: commercial, wax-like emulsion.
- .4 Filter Cloth:
  - .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m<sup>2</sup> mass.
  - .2 Type 2: biodegradable burlap.
- .5 Wood posts: 38 x 89 x 2400 mm length, untreated wood.
- .6 Welded wire fabric (WWF): 100 x 100 mm to CSA G30.5.

**Part 3 EXECUTION**

**3.1 IDENTIFICATION AND PROTECTION**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.
- .3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.
- .4 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

**3.2 ROOT CURTAIN SYSTEM**

- .1 Identify limits for required construction excavation as approved by Departmental Representative.
- .2 Prior to construction excavation, hand dig trench minimum 500 mm wide x 1500

- mm deep, along perimeter of excavation limits.
- .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
  - .4 Install wooden posts and welded wire fabric against construction edge of trench.
  - .5 Securely attach filter fabric on plant side of wire mesh.
  - .6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
    - .1 Add organic matter to mixture to achieve 7-9 % organic matter content by weight.
    - .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5kg/m<sup>3</sup>.
  - .7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85 % Standard Proctor Density.
  - .8 Protect root curtain from damage during construction operations.
  - .9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
  - .10 Protect root curtain before and during backfill operations. Ensure root curtain is cut down to 300 mm below finished grade and remove cut material.
  - .11 Depending on the percentage of loss of the root system, crown / root balance should be restored by performing compensatory pruning, where the same percentage of branches is removed, prioritizing diseased, deleterious, weak and / or misplaced branches.
  - .12 The ground level must be the same to the one that was present before the work.

### **3.3 ANTI-DESICCANT**

- .1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION**

- .1 The Contractor will supply the granular materials required for the realization of the granular base layer for the correction of the pedestrian paths and for the reconstruction of the paving stone after the works.

### **1.2 EXIGENCES CONNEXES**

- .1 31 05 16 – Aggregate materials.
- .2 01 74 19 - Construction demolition waste management and disposal.
- .3 31 23 33\_01F - Excavating, trenching and backfilling.

### **1.3 RÉFÉRENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C 117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D 1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D 4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver aggregates in accordance with Section 31 05 16 - Aggregate Materials.

### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Divert unused granular material from landfill to local facility as approved by Departmental Representative.

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 MG20 granular base: material in accordance with Sections 31 05 16 - Aggregates and Requirements and 31 23 33\_01E - Excavation, Trenching and Backfilling.

**Part 3 EXECUTION**

**3.1 SEQUENCE OF OPERATION**

- .1 Place granular base after sub-base surface is inspected and approved by Departmental Representative.
- .2 Placing
  - .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .5 Place material to full width in uniform layers not exceeding 200 mm compacted thickness.
  - .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment
  - .1 Compaction equipment to be capable of obtaining required material densities.
- .4 Compacting
  - .1 Compact to density not less than 95% corrected maximum dry density.
  - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .3 Apply water as necessary during compacting to obtain specified density. If the soil is too wet, aerate it by scarifying it with the appropriate equipment until its water content is back to normal.

**3.2 SITE TOLERANCES**

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A 90/A 90M-13, Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - .3 ASTM A 121-13, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
  - .4 A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5 ASTM C 618-15, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
  - .6 ASTM F 1664-08(2013), Standard Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
  - .2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.
  - .3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.
  - .4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.
  - .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-A23.1/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  - .2 CAN/CSA-G164-FM92 (C2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CAN/CSA-A3000-13, Cementitious Materials Compendium. Includes:
    - .1 CAN/CSA-A23.5-98, Supplementary Cementing Materials
- .4 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.

### **1.3 HEALTH AND SAFETY**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal .
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete and CAN/CSA-A23.1.
  - .1 Nominal coarse aggregate size: 20-5.
  - .2 Compressive strength: 20 MPa minimum at 28 days.
  - .3 Additives: fly ash to CAN/CSA-A23.5.
- .2 Chain-link fence fabric: to CAN/CGSB-138.1.
  - .1 Type 1, Class A, medium style, Grade 1.
  - .2 Height of fabric: as indicated.
  - .3 Color: Black.
- .3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated.
- .4 Top and bottom tension wire: to CAN/CGSB-138.2, single strand, galvanized steel wire.
- .5 Tie wire fasteners: steel wire.
- .6 Tension bar: to ASTM A 653/A 653M, 5 x 20 mm minimum galvanized steel.
- .7 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.
  - .1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.
  - .2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.
  - .3 Overhang tops to provide waterproof fit, to hold top rails and an outward projection to hold barbed wire overhang.
  - .4 Provide projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart.
  - .5 Projection of approximately 300 mm long to project from fence at 45 degrees above horizontal.
  - .6 Turnbuckles to be drop forged.

- .8 Grounding rod: 16 mm diameter copperwell rod, 3 m long.

### **Part 3 EXECUTION**

#### **3.1 GRADING**

- .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
- .2 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

#### **3.2 INSTALLATION DE LA CLÔTURE**

- .1 Erect fence along lines as indicated and to CAN/CGSB-138.3.
- .2 Excavate post holes to dimensions indicated.
- .3 Space line posts 3 m apart, measured parallel to ground surface.
- .4 Space straining posts at equal intervals not to exceed 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 150 m.
- .5 Install additional straining posts at sharp changes in grade and where directed by Departmental Representative.
- .6 Install corner post where change in alignment exceeds 10 degrees.
- .7 Install end posts at end of fence and at buildings.
  - .1 Install gate posts on both sides of gate openings.
- .8 Place concrete in post holes then embed posts into concrete to depths indicated.
  - .1 Extend concrete 50 mm above ground level and slope to drain away from posts.
  - .2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
- .9 Do not install fence fabric until concrete has cured minimum of 5 days.
- .10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.
  - .1 Install braces on both sides of corner and straining posts in similar manner.
- .11 Install overhang tops and caps.
- .12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.
- .13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
- .14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.
  - .1 Knuckled selvedge at bottom.
  - .2 Twisted selvedge at top.

- .15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.
  - .1 Give tie wires minimum two twists.
- .16 Install grounding rods as indicated.

### **3.3 TOUCH UP**

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.
  - .1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

### **3.4 CLEANING**

- .1 Clean and trim areas disturbed by operations.
  - .1 Dispose of surplus material and replace damaged turf with sod as directed by Departmental Representative.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 01 29 83 – Payment procedure for testing laboratory
- .2 01 33 00 – Submittal procedures
- .3 32 92 23 - Sodding.
- .4 32 93 10 - Trees shrubs and ground planting
- .5 01 74 11 - Cleaning

### **1.2 MEASUREMENT PROCEDURES**

- .1 Measurement Procedures: in accordance with Section 01 29 00 - Payment Procedures.

### **1.3 PAYMENT**

- .1 Testing of topsoil: Departmental Representative will pay for cost of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

### **1.4 REFERENCES**

- .1 Agriculture and Agri-Food Canada
  - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
  - .1 PN1340-2005, Guidelines for Compost Quality.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .4 Bureau de normalisation du Québec (BNQ)
  - .1 Standard NQ 0605-100 “Aménagement paysager à l’aide de végétaux”.

### **1.5 DEFINITIONS**

- .1 Compost:
  - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
  - .2 Compost is processed organic matter containing 40 % or more organic matter as determined by Walkley-Black or Loss on Ignition (LOI) test.
  - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C: N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminants.
  - .4 Composted bio-solids to: CCME Guidelines for Compost Quality, Category (A).

## **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
  - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
  - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## **1.7 QUALITY ASSURANCE**

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.07 - *Construction Progress Schedules - Bar (GANTT) Chart*.

## **1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

## **Part 2 PRODUCTS**

### **2.1 TOPSOIL**

- .1 Topsoil must contain between 3% and 20% of organic matter (dry basis). It must be fertile and friable. The soil bulk density should not exceed 1800 kg/m<sup>3</sup>.
- .2 Topsoil must respect the following requirements:
  - .1 pH :  $5 < \text{pH} < 7,5$ ;
  - .2 Phosphorus (ppm) :  $\geq 27$ ;
  - .3 Potassium (ppm) :  $\geq 45$ ;
  - .4 Calcium (ppm) :  $\leq 4000$ ;
  - .5 Sodium (ppm) :  $\leq 135$ .

### **2.2 PLANTING SOIL**

- .1 Planting soil must contain between 6% and 30% of organic matter (dry basis). Its particle size must belong to one of the following agronomical textural class: loam, silt loam, sandy loam, or loamy sand.
- .2 Planting soil must be uniform and free of rocks, wooden debris or foreign bodies of more than 25 mm in diameter.

- .3 Planting soil must have the following chemical composition:
  - .1 pH :  $6 < \text{pH} < 7$ ;
  - .2 Cation exchange capacity (C.E.C.) :  $\geq 10$  ;
  - .3 Electric conductivity (mS/cm) :  $< 3,5$ ;
  - .4 Phosphorus (ppm) :  $\geq 40$ ;
  - .5 Potassium (ppm) :  $\geq 100$ ;

### **2.3 SOIL AMENDMENTS**

- .1 Fertilizer:
  - .1 Fertility: major soil nutrients present in following amounts:
  - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
  - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
  - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
  - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
  - .6 Ph value: 6.5 to 8.0.
- .2 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous, brown in color.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to coarse textured.
- .4 Organic matter: compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Limestone:
  - .1 Ground agricultural limestone.
  - .2 Gradation requirements: percentage passing by weight, 90 % passing 1.0 mm sieve, 50 % passing 0.125 mm sieve.
- .6 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

### **2.4 SOURCE QUALITY CONTROL**

- .1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.

- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
  - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

### **Part 3 EXECUTION**

#### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### **3.2 STRIPPING OF TOPSOIL**

- .1 In accordance with Section 31 23 33.01 – *Excavating Trenching and Backfilling*.

#### **3.3 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct.
  - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
  - .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
  - .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
    - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
    - .2 Remove debris which protrudes more than 75 mm above surface.
    - .3 Dispose of removed material off site.
  - .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
    - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

#### **3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement.
  - .1 135 mm for sodded areas.

- .5 For planting pits, spread the soil in successive layers of 300 mm and compact the soil in each layer to allow the planting of trees without subsequent subsidence. The compaction method must be approved by Departmental Representative. The soil must be compacted to 90% of P.M.
- .6 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

### **3.5 SOIL AMENDMENTS**

- .1 For turf: apply and thoroughly mix soil amendments into full specified depth of topsoil.

### **3.6 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
  - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
  - .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
    - .1 Leave surfaces smooth, uniform and firm against deep foot printing.

### **3.7 ACCEPTANCE**

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

### **3.8 SURPLUS MATERIAL**

- .1 Dispose of materials except topsoil not required off site.

### **3.9 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal procedures
- .2 Section 32 91 19.13 – Topsoil Placement and Grading.

**1.2 MEASUREMENT PROCEDURES**

- .1 Measurement Procedures: in accordance with Section 01 29 00 - *Payment Procedures*.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Samples.
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Obtain approval of samples by Departmental Representative.

**1.4 QUALITY ASSURANCE**

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements. Comply with Section 01 31 19 – Project Meetings.

**1.5 SCHEDULING**

- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation when frost is not present in ground.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
  - .1 Turf Grass Nursery Sod types:
    - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
    - .2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30 % Chewing Fescue or Creeping Red Fescue cultivars.
    - .3 Number One Named Cultivars: Nursery Sod grown from certified seed.
  - .2 Turf Grass Nursery Sod quality:
    - .1 Not more than 2 broadleaf weeds or 10 other weeds per 40 square meters.
    - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
    - .3 Mowing height limit: 35 to 65 mm.
    - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Commercial Grade Turf Grass Nursery: sod that has not been grown as Turf Grass Nursery Sod crop.
  - .1 Mow sod at height directed by Departmental Representative within 36 hours prior to lifting, and remove clippings.
  - .3 Sod establishment support:
    - .1 Wooden pegs: 17 x 8 x 200 mm.
    - .2 Biodegradable starch pegs: 17 x 8 x 200 mm.
  - .4 Water:
    - .1 Contractor shall supply the water.
  - .5 Fertilizer:
    - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
    - .2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Obtain approval from Departmental Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

## **Part 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

### **3.2 SOD PLACEMENT**

- .1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 °C.
- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

### **3.3 SOD PLACEMENT ON SLOPES AND PEGGING**

- .1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.
- .2 Start laying sod at bottom of slopes.
- .3 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:
  - .1 100 mm below top edge at 200 mm on center for first sod sections along contours of slopes.
  - .2 Not less than 3-6 pegs per square meter.
  - .3 Not less than 6-9 pegs per square meter in drainage structures. Adjust pattern as directed by Departmental Representative.
  - .4 Drive pegs to 20 mm above soil surface of sod sections.

**3.4 FERTILIZING PROGRAM**

- .1 Fertilize during establishment and warranty periods of product.

**3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of installation until acceptance.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
- .3 Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which will smother grassed areas as directed by Departmental Representative.
- .4 Maintain sodded areas weed free 95 %.
- .5 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

**3.6 ACCEPTANCE**

- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
  - .1 Sodded areas are properly established.
  - .2 Sod is free of bare and dead spots.
  - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
  - .4 Sodded areas have been cut minimum two times prior to acceptance.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

**3.7 MAINTENANCE DURING WARRANTY PERIOD**

- .1 Perform following operations from time of acceptance until end of warranty period:
  - .1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
  - .2 Repair and resold dead or bare spots to satisfaction of Departmental Representative.
  - .3 Cut grass and remove clippings that will smother grass as directed by Departmental Representative to height as follows:
    - .1 Turf Grass Nursery Sod:
      - .1 50 mm during normal growing conditions.
    - .2 Cut grass at two week intervals, but at intervals so that approximately one third of growth is removed in single cut.
    - .3 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

- 
- .4 Eliminate weeds by mechanical means to extent acceptable to Departmental Representative.

**3.8 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for plant material, accessories, mulch, planting, tree support, mulching and maintenance.

### **1.2 REFERENCES**

- .1 Agriculture and Agri-Food Canada (AAFC).
  - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA).
  - .1 Canadian Standards for Nursery Stock-2001.
- .3 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .2 Transportation of Dangerous Goods Act (TDGA), 1992, c.34.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

### **1.3 DEFINITIONS**

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for:
  - .1 Fertilizer.
  - .2 Mycorrhiza.
  - .3 Anti-desiccant.
  - .4 Guying assembly including clamps, collar, guying wire, anchors and wire tightener.
  - .5 Mulch.
- .3 Submit WHMIS MSDS.
- .4 Submit samples for:
  - .1 Mulch.
  - .2 Mycorrhiza.

## **1.5 QUALITY ASSURANCE**

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.6 STORAGE AND PROTECTION**

- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
- .2 Immediately store and protect plant material which will not be installed within 1 hour after arrival at site in storage location approved by Departmental Representative.
- .3 Protect plant material from damage during transportation:
  - .1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
  - .2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
  - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .4 Protect stored plant material from frost, wind and sun and as follows:
  - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
  - .2 For pots and containers, maintain moisture level in containers. Heel-in fiber pots.
  - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
- .5 Waste Management and Disposal:
  - .1 In accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Divert unused wood and mulch materials from landfill to recycling facility approved by Departmental Representative.

## **1.7 SCHEDULING**

- .1 Obtain approval from Departmental Representative of schedule 7 days in advance of shipment of plant material.
- .2 Schedule to include: :
  - .1 Quantity and type of plant material.;
  - .2 Shipping dates;
  - .3 Arrival dates on site;

.4 Planting Dates.

## **1.8 WARRANTY**

- .1 For plant material over 75 mm caliper the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 24 months.
- .2 The Contractor hereby warrants that plant material over 75 mm caliper will remain free of defects in accordance with General Conditions (GC), but for 1 full growing season, one time only providing adequate maintenance has been provided.
- .3 End-of-warranty inspection will be conducted by Departmental Representative.
- .4 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

## **Part 2 PRODUCTS**

### **2.1 SUSTAINABLE REQUIREMENTS**

- .1 Not used

### **2.2 PLANT MATERIAL**

- .1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
  - .1 Source of plant material: grown in Zone 2000 6a in accordance with Plant Hardiness Zones in Canada.
  - .2 Plant material must be planted in zone indicated as appropriate for its species.
  - .3 Plant material in location appropriate for its species.
- .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system
- .3 Trees larger than 50 mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season prior to arrival on site.
- .4 Species of trees to be provided: for the replacement of the trees mentioned in the plans, provide, respecting the following ratio, 1 butternut, 1 bur oak, 2 basswoods. Unless otherwise indicated, trees with a straight trunk and characteristic branch of the species.
- .5 Trees felled in Area 23 shall be replaced by Butternut trees (*Juglans cinerea*). Validate the optimal size of the trees to ensure the survival of these trees and get a mature tree as quickly as possible.
- .6 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

- .7 Collected stock: maximum 40 mm in caliper, with well-developed crowns and characteristically branched; no more than 40 % of overall height may be free of branches.

## **2.3 WATER**

- .1 Free of impurities that would inhibit plant growth.

## **2.4 STAKES**

- .1 T-bar, steel, 40 x 40 x 5 x 2440 mm.

## **2.5 ANCHORS**

- .1 Wood:
  - .1 Type 1: 38 x 38 x 460 mm.
- .2 Drive-in type:
  - .1 Type 1: 13 mm diameter x 75 mm long, aluminum.
- .3 Screw-in type:
  - .1 Type 1: 100 mm diameter steel disc.

## **2.6 GUYING WIRE**

- .1 # 9 galvanized steel with galvanized steel tensioner

## **2.7 GUYING COLLAR**

- .1 Tube: plastic, 13 mm diameter, nylon reinforced.

## **2.8 MULCH**

- .1 Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

## **2.9 FERTILIZER**

- .1 Synthetic commercial type as recommended by manufacturer.

## **2.10 ANTI-DESICCANT**

- .1 Wax-like emulsion.

## **2.11 SOURCE QUALITY CONTROL**

- .1 Obtain approval from Departmental Representative of plant material prior to planting.
- .2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal or Provincial regulations.

**Part 3 EXECUTION**

**3.1 PRE-PLANTING PREPARATION.1**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Ensure plant material acceptable to Departmental Representative.
- .3 Remove damaged roots and branches from plant material.
- .4 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

**3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS**

- .1 Preparation of planting beds is specified in Section 32 91 19.13 - Topsoil Placement and Grading.
- .2 For individual planting holes:
  - .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
  - .2 Excavate to depth and width as indicated.
  - .3 Remove rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
  - .4 Scarify sides of planting hole.
  - .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

**3.3 PLANTING**

- .1 For bare root stock, place 50 mm backfill soil in bottom of hole. Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball. Do not pull burlap or rope from under root ball.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:
  - .1 Backfill soil in 150 mm lifts. Tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.
  - .2 Form watering saucer as indicated.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.

- .8 After soil settlement has occurred, fill with soil to finish grade.
- .9 Dispose of burlap, wire and container material off site.

### **3.4 TREE SUPPORTS**

- .1 Install tree support as indicated.
- .2 Install one tree support for deciduous trees under 3 m and evergreen trees of less than 2 m high.
  - .1 Place stake on prevailing wind side and 150 mm from trunk.
  - .2 Drive stake minimum 150 mm into undisturbed soil beneath roots. Ensure stake is secure, vertical and unsplit.
  - .3 Install 150 mm long guying collar 1500 mm above grade.
  - .4 Thread Type 1 guying wire through guying collar tube. Twist wire to form collar and secure firmly to stake. Cut off excess wire.
- .3 Use 3 guy wires and anchors for deciduous trees greater than 3 m and evergreens greater than 2 m.
- .4 After tree supports have been installed, remove broken branches with clean, sharp tools.

### **3.6 MULCHING**

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

### **3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
  - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
    - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
    - .2 Replace or respread damaged, missing or disturbed mulch.
    - .3 For non-mulched areas, cultivate as required to keep top layer of soil friable.
    - .4 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
    - .5 Remove dead or broken branches from plant material.

- .6 Keep trunk protection and guy wires in proper repair and adjustment.
- .7 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

### **3.8 MAINTENANCE DURING WARRANTY PERIOD**

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
  - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
  - .2 Reform damaged watering saucers.
  - .3 Remove weeds monthly.
  - .4 Replace or respreads damaged, missing or disturbed mulch.
  - .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
  - .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
  - .7 Apply fertilizer in early spring as indicated by soil test.
  - .8 Remove dead, broken or hazardous branches from plant material.
  - .9 Keep trunk protection and tree supports in proper repair and adjustment.
  - .10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
  - .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
  - .12 Submit monthly written reports to Departmental Representative identifying:
    - .1 Maintenance work carried out.
    - .2 Development and condition of plant material.
    - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

### **3.9 VERIFICATION**

- .1 Not used

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 01 11 11 – Summary description of Work
- .2 Section 01 35 43 – Environmental Protection
- .3 Section 01 35 13 45F – Special procedures contaminated site

### **1.2 REFERENCES**

- .1 Ministère du Développement durable, de l'Environnement, et de la Lutte contre les changements climatiques (MDDELCC). 2016. Politique de protection des sols et de réhabilitation des terrains contaminés. En ligne. <http://www.mddelcc.gouv.qc.ca/sol/terrains/politique/>.
- .2 Ministère du Développement durable, de l'Environnement, et de la Lutte contre les changements climatiques (MDDELCC). 2016. Règlement sur le stockage et les centres de transfert de sols contaminés, Direction du suivi de l'état de l'environnement.
- .3 Ministère du Développement durable, de l'Environnement, et de la Lutte contre les changements climatiques (MDDELCC). 2016. Règlement sur l'enfouissement des sols contaminés, Direction du suivi de l'état de l'environnement.
- .4 Ministère du Développement durable, de l'Environnement, et de la Lutte contre les changements climatiques (MDDELCC). 2013. Critères de qualité de l'eau de surface, 3e édition. Direction du suivi de l'état de l'environnement.
- .5 Étude de caractérisation environnementale des sols, Réhabilitation des murs aval du Canal-Sainte-Anne-de-Bellevue, GHD, Version préliminaire, 11131157-E1.

### **1.3 SEDIMENTS MANAGEMENT**

- .1 This section covers the soils to be excavated at the sea bed in the areas specified at plans as well as the soils under the existing jetty of Canal Sainte-Anne-de-Bellevue.
- .2 The dredged sediment should be considered as soil and its management must comply with the *Politique de protection des sols et de réhabilitation des terrains contaminés*. The dredged and excavated soil materials under the docks will be removed and stored on land.
- .3 The marine sediments managed on land must be drained prior to disposal off site. The method of drying must be compliant in section 01 35 13 45F – Special procedures contaminated site. The water discharged during the drying must meet the applicable criteria indicated in *les critères de qualité d'eau de surface du MDDELCC (MDDELCC, 2013)*.
- .4 The materials will be sent to a disposal site according to their level of contamination.
- .5 Some soils in the water and on the upstream and downstream area of the jetty have PAH (polycyclic aromatic hydrocarbon) concentrations in the A-B, B-C and > C

range of the criteria of *Politique de protection des sols et de réhabilitation des terrains contaminés*. The excavated soil in these ranges must be managed at worksite as mentioned in section 01 35 13 45F – *Procédures spéciales site contaminé*. The disposal of the surplus must respect the policy and municipal regulations. Ultimately, this material will be directed, after approval of Departmental Representative, to an engineered landfill (LET).

- .6 Soils categorized inferior to the A criteria may be reused without restriction.
- .7 In the event that during the excavation work, visual or olfactory clues do not match the anticipated level of contamination, temporarily store these soils on the site at a designated location, perform the required analysis and dispose of these soils according to their level of contamination.
- .8 At the end of the excavation work on land, document the environmental quality of the soil and walls of the excavation funds taking into account the methodology of the various MDDELCC characterization guides. If the soils of the excavation walls are contaminated at a level above the applicable criteria, place a geotextile membrane to protect the backfill soil in the excavation. If soils of the bottom of excavations are contaminated at a level above the applicable criteria continue excavation down to a level where the applicable criteria are met.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not used

END OF SECTION

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 29.06 – Health and Safety
- .2 Section 01 35 43 – Environmental procedures
- .3 Section 01 74 21 – Construction demolition waste management and disposal
- .4 Section 31 23 33 01.01 – Excavating, trenching and backfilling
- .5 Section 35 20 23A – Sediment management

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM C117-03, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C127-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
  - .3 ASTM C136-0, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 Office des normes générales du Canada (CGSB).
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

### **1.3 QUALITY ASSURANCE (QA)**

- .1 Health and Safety
  - .1 Follow the required health and safety measures for construction as per section 01 35 29.06 – Health and Safety.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Environmental Protection
  - .1 Take appropriate control measures against erosion and sedimentation in order to prevent soil erosion and sediment they contain and the migration of suspended sediment in downstream areas during the execution of the work, in accordance with Section 01 35 43 – Environmental procedures.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS/EQUIPMENT**

- .1 Material to following requirements:
  - .1 Crushed quarry stone consisting of hard durable particles free from clay lumps, frozen material and other deleterious materials, and free from splits, seams or defects likely to impair its soundness during handling or under action of water.

- .2 Relative density: to ASTM C127, not less than 2.65 to 2.85.
- .3 Gradations: to ASTM C117. Sieve sizes: to CAN/CGSB-8.1.

### **Part 3 EXECUTION**

#### **3.1 PLACEMENT**

- .1 Generality
  - .1 The equipment used for the placement of the stone must be able to lay the stone without releasing it more than 0.3 m above its final position and must also be able to move and reposition a stone if necessary .
  - .2 Place the stones so that they are well supported on the one below and be in firm contact with the neighboring stones. It may be necessary to change the arrangement of adjacent stones to achieve this result.
  - .3 The stones should be placed in an irregular arrangement with a random orientation so that the joints between the neighboring stones are not aligned.
  - .4 The finishing of the outer slopes must be done as the layer of protective stone is laid.
  - .5 Stonework should be considered final when the Departmental Representative has approved the implementation.
  - .6 Prior to final acceptance, any damage to the existing structure or stone layers partially constructed or approved as a result of the Contractor's or subcontractor's operations, wind, waves, tides or Ice must be repaired by the Contractor at his expense.
  - .7 Stones should be placed carefully to avoid damage to existing structures. All costs of repair and / or replacement of these works, which would have been damaged for lack of the necessary precautions, are the responsibility of the Contractor.
  - .8 The placement by any method likely to cause segregation in a given category of stone is not permitted. The set-up should start at the bottom of the slope and go up. It is not allowed to throw stone or move it by shifting or handling down. The final slope and the height must be done as the stone is put in place.

#### **3.2 CONTROL OF TURBIDITY**

- .1 The Contractor must control the placement of stones to minimize turbidity. The Contractor's operations must comply with the requirements of sections 01 35 43 - Environmental Protection.

**END OF SECTION**



## **Geotechnical Study**

Reconstruction of the Sainte-Anne-de-Bellevue Channel  
Retaining Wall

Sainte-Anne-de-Bellevue, Quebec

Tetra Tech File No.: 29501TTG

TPSGC File No.: R.077243.400

Tetra Tech

**GHD** | 4600, boulevard de la Côte-Vertu, Montréal (Québec) H4S 1C7, Canada

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Appendix B	Borehole Reports and Rock Photographs
Appendix C	Test Pit Reports and Wall Photographs
Appendix D	Laboratory Test Reports



# 1. Introduction

The technical services of GHD were retained by Tetra Tech, represented by Mr. Jonathan Renaud, Eng., to carry out a Geotechnical Study and an Environmental Soil Characterization for the partial reconstruction of the Sainte-Anne-de-Bellevue Channel retaining wall in Sainte-Anne-de-Bellevue, Quebec.

The terms of this mandate are presented in GHD's Offer of Professional Services No. 11118182-98-A1, dated February 22<sup>nd</sup>, 2017.

According to the information provided in the document titled "*Demande de proposition de services professionnels – Étude géotechnique et caractérisation environnementale des sols – Révision 02*", dated February 22<sup>nd</sup> 2017, the project consists of the reconstruction and/or rehabilitation of the following structures:

- Upstream Jetty – Sainte-Anne Street
- Island Field – Channelside
- Downstream Jetty – Islandside
- Island Field – Riverside

The two (2) structures concerned in this study are the "Downstream Jetty – Islandside" and the "Island Field – Riverside".

The purpose of this study is to:

- Determine the nature and characteristics of the *in-situ* soil and bedrock.
- Determine the characteristics of the downstream jetty retaining wall structure.
- Determine the environmental characteristics and quality in the affected soundings; these findings are presented in a separate report.

This report describes the entirety of field and laboratory work methods and results related to this project and is accompanied by four (4) appendices containing the following elements:

Appendix A      Site Location Plan (*Plan No. 11131157-A1-1*)

Appendix B      Borehole Reports and Rock Photographs

Appendix C      Test Pit Reports and Wall Photographs

Appendix D      Laboratory Test Reports

This report is subject to a number of limiting conditions due to the inherent nature of geological, geotechnical, and hydrogeological profiles determined by investigative soundings. The applicable limitations of this study are explained following the technical section of this report. These limiting conditions are an integral part of this report and the reader is strongly encouraged to inform themselves in order to facilitate their comprehension, interpretation, and use of this document.



## 2. Worksite Location and Description

The worksite is located in the Sainte-Anne-de-Bellevue Channel National Historic Park in Sainte-Anne-de-Bellevue, Quebec. The worksite is occupied by several zones and structures. However, only the “Downstream Jetty – Islandside” and the “Island Field – Riverside” structures, located in the eastern part of the worksite, are concerned within the present study.

The “Island Field – Riverside” structure, located in the western part of the Galipeau Bridge, sits roughly 0.6 m above the river.

The majority of the works were carried out on the “Downstream Jetty – Islandside”, east of the Galipeau Bridge. In terms of topography the jetty is relatively flat, with an elevation of roughly 22.9 m. The jetty has an approximate length of 330 m and is flanked by water on both sides.

A retaining wall with an approximate length of 250 m exists along the southern side of the eastern part of the jetty. The wall consists of a section of concrete and stone blocks.

During fieldwork, the water level around the jetty had an elevation of approximately 21.7 m, or 1.2 m below the top of the jetty.

The Site Location Plan No. 11131157-A1-1 included in Appendix A of this report illustrates the investigated area, the sounding locations as well as the surrounding structures.

## 3. Methods of Investigation

In this study, boreholes, test pits, and laboratory tests were performed and are described in the following subsections.

### 3.1 Fieldwork

Fieldwork consisted of the execution of a total of six (6) boreholes (F-01 to F-03 and F-05 to F-07) and six (6) test pits (TR-01 to TR-06). These soundings were positioned close to the two (2) structures to be investigated. It is worth mentioning that the initially proposed borehole F-04 was cancelled in accordance with the client due to time constraints.

Table 3.1 shown below presents the work program summary:

**Table 3.1 Work Program**

Borehole No.	Zone/Structure
F-01 and F-02	Island Field – Riverside
F-03, F-05 to F-07 and TR-01 to TR-06	Downstream Jetty – Island

The location of the soundings are illustrated in Plan No. 11131157-A1-1 in Appendix A.

The work program (type, location, and depth of soundings) was established by the client.



### **3.1.1 Soundings**

Each sounding consisted of a detailed description of each stratum and formation encountered along with any pertinent supplementary information.

Fieldwork was conducted between the 8<sup>th</sup> and 13<sup>th</sup> of March, 2017 under the full-time supervision of a member of GHD's technical staff.

In addition to supplementary notes relative to each sounding log, a description of each stratigraphic unit, *in-situ* sounding methodology is presented in Appendix B of this report.

#### **3.1.1.1 Boreholes**

The boreholes were drilled by means of a track-mounted CME-55 hollow-stem auger drill rig equipped for soil and rock sampling and reached final depths varying between 4.54 and 8.33 m.

Sampling procedures within the native soils were performed in accordance with the American Society for Testing and Materials (ASTM) Standard D-1586, which instructs soil samples to be taken at regular intervals with standard "B" and non-standard "N" calibre split-spoon samplers that may provide the penetration resistance ("N-Value") of the soils.

Rock core samples were recovered by means of an NQ-calibre diamond drill bit.

#### **3.1.1.2 Test Pits**

Test pits were excavated using a backhoe and reached depths varying between 1.20 and 1.80 m.

All test pits except for test pit TR-06 showed strong water infiltration. The lack of water infiltration observed in test pit TR-06 is due in part by the fact that it was carried out with the primary objective of determining the presence and dimensions of shallow concrete installations.

A concrete installation was found during the excavation of test pit TR-02 along with a steel rod at an approximate depth of 2.0 m.

Finally, criss-crossing steel rods with diameters of roughly 5 cm were also found within test pit TR-05 at depths of approximately 0.7 to 1.05 m.

Test pit TR-06 revealed the presence of a concrete installation with a steel frame at a depth of approximately 0.6 m.

### **3.1.2 Surveying**

The elevations of the completed soundings on the site were measured by our technical personnel using a portable LEICA Global Positioning System (GPS) receiver unit, which uses high-precision satellite positioning.

All sounding positions were pre-established by the client and surface elevations at the sounding locations are geodetically-referenced in meters.



### 3.2 Geotechnical Laboratory Testing

All of the recovered geotechnical soil samples were transported to our laboratory, where they were logged and visually identified for presentation in this report.

Geotechnical laboratory testing was conducted on representative soil and bedrock samples. The laboratory-testing program consisted of:

- Ten (10) Grain-Size Distribution Analyses.
- Ten (10) Water Content Determinations.
- Three (3) Unconfined Uniaxial Compression Tests.

Detailed results of the geotechnical laboratory tests are presented in Appendix D and are described in Section 4.0 of this report.

Borehole samples will be stored for a six-month period, after which they will be discarded unless otherwise requested by the Client.

## 4. Soil and Bedrock Description

Detailed subsurface conditions encountered at each borehole location are presented within the borehole reports included in Appendix B of this report.

Table 4.1 below presents an overview of the depth and elevation of each subsurface stratum encountered at the borehole locations.

**Table 4.1 Stratigraphic Summary - Depth (Elevation) in meters (m)**

Borehole No.	Borehole Elevation	Topsoil Thickness	Fill Layer Thickness	Bedrock
F-01	23.68	--	5.35*	6.23 (17.45)
F-02	24.26	--	6.63	6.63 (17.63)**
F-03	22.92	0.10	3.16	3.26 (19.66)
F-05	22.86	0.07	6.58	6.65 (16.21)
F-06	23.06	0.06	4.61	4.67 (18.39)
F-07	23.00	0.08	5.98	6.06 (16.94)**

*Notes: --: Material not encountered*

*\*: A concrete installation with a thickness of 0.8 mm encountered below the fill layer*

*\*\* : Probable bedrock*

The stratigraphy of the test pits was not presented in the above table because each test pit revealed only the presence of a fill layer, which is insufficient to confirm its total thickness relative to the overall stratigraphy.

The following subsections summarize the soil and bedrock conditions within each sounding.



## 4.1 Topsoil and Fill Layer

A thin layer of topsoil with thicknesses varying between 60 and 100 mm was encountered within soundings F-03, F-05 to F-07, and TR-01 to TR-06.

Fill was found within each sounding, with a thickness varying between 3.16 and 6.63 m.

The fill layers had a heterogeneous composition, but primarily consisted of gravelly sands with variable amounts of finer grains. Debris consisting of concrete, metal, wood, and glass was also found within the fill layer.

Furthermore, a considerable amount of boulders and cobbles was also found within the fill layer varying between 5 and 40% in proportion depending on location. By definition, cobbles are clasts with diameters ranging between 75 and 300 mm, while boulders have diameters greater than 300 mm.

Table 4.2 below presents the results of the ten (10) grain-size distribution analyses carried out on ten (10) representative samples in the laboratory.

**Table 4.2 Fill Layer Grain-size Distribution Results**

Sounding No.	Sample No.	Depth (m)	Water Content (%)	Grain-size Distribution (%)		
				Gravel	Sand	Silt and Clay
				> 4,75 mm	4,75 mm – 0,075 mm	< 0,075 mm
TR-01	VR-2	1.0-1.20	15	28	35	37
TR-03	VR-1	0.05-1.50	14	17	48	35
TR-04	VR-2	0.05-1.00	13	29	24	47
TR-05	VR-2	0.25-1.00	9	51	32	17
F-02	CF-3	1.22-1.83	2	43	39	18
F-03	CF-4	2.28-2.89	55	1	6	94
F-05	CF-2	0.61-1.22	6	75	21	4
F-05	CF-6	3.05-3.66	19	63	26	11
F-06	CF-3	1.52-2.13	4	85	13	2
F-07	CF-7	3.81-4.42	11	71	24	6

Overall, the fill can be categorized as loose to compact, with N-values generally below 30.

As previously mentioned, test pits TR-01 to TR-06 were all terminated between 1.20 and 1.80 m due to considerable water infiltration during and at the base of the excavation.



## 4.2 Bedrock

### 4.2.1 Regional geology

According to geological maps of the St. Lawrence Lowlands, the worksite is located within the contact zone between the Covey Hill and Beauharnois formations of Cambrian and Ordovician age, respectively. These formations consist of sandstones/conglomerates (Covey Hill) or dolomite (Beauharnois).

The Sainte-Anne-de-Bellevue Fault also cuts the worksite along a principally east-west axis.

### 4.2.2 Bedrock Description

Table 4.1 above presents the depths and elevations of the bedrock encountered.

The bedrock consists of a locally-fractured grey-pink sandstone with RQD values varying between 23 and 89%, corresponding to a poor to good quality rock. Rock core photos are presented in Appendix B of this report.

Table 4.3 below presents the results of the three (3) compressive tests conducted in the laboratory.

**Table 4.3 Rock Compressive Strength Results**

Sample No.	Compressive Strength (MPa)	Density (kg/m <sup>3</sup> )
F-01/CR-13	279	2613
F-03/CR-6	309	2735
F-05/CR-12	73	2527

The low compressive strength of F-05/CR-12 is likely due alteration already present in the sample.

## 5. Groundwater Conditions

Water infiltration was observed at different depths and with varying intensities in most of the test pits conducted. Table 5.1 below presents the test pit water infiltration depth measurements.

**Table 5.1 Test Pit Water Infiltration Observations**

Test Pit No.	Water Infiltration – Depth m (elevation)
TR-01	1.15 (21.59)
TR-02	1.20 (21.73)
TR-03	1.35 (21.66)
TR-04	1.30 (21.55)
TR-05	1.65 (21.05)
TR-06	No infiltration observed

The level of the river is controlled by the level of Lake Saint-Louis and that water infiltration in the test pits generally coincide with the height of the river.



## 6. Downstream Jetty Retaining Wall

A retaining wall with an approximate length of 250 m exists along the southern side of the eastern part of the jetty. The wall is composed of concrete in the easternmost section of the jetty near test pit TR-05 and is exposed transitioning to a stone block wall within it.

Certain test pits in this study were conducted in order to better identify the dimensions of the retaining wall. In most cases, the base of the excavations were unidentifiable due to strong water infiltration. The test pit reports and details of the wall dimensions are presented in Appendix C.

## 7. Limitations of the Study

This report is intended solely for **Tetra Tech** and other parties explicitly identified in the report and is prohibited for use by others without **GHD's** prior written consent. This report is considered **GHD's** professional work product and shall remain the sole property of **GHD**. Any unauthorized reuse, redistribution of, or reliance on the report shall be at the Client and recipient's sole risk, without liability to **GHD**. The Client shall defend, indemnify and hold **GHD** harmless from any liability arising from, or related to, the Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of geotechnical engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the test locations only. The subsurface conditions confirmed at the test locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on Site (ex., excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost.

Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation.



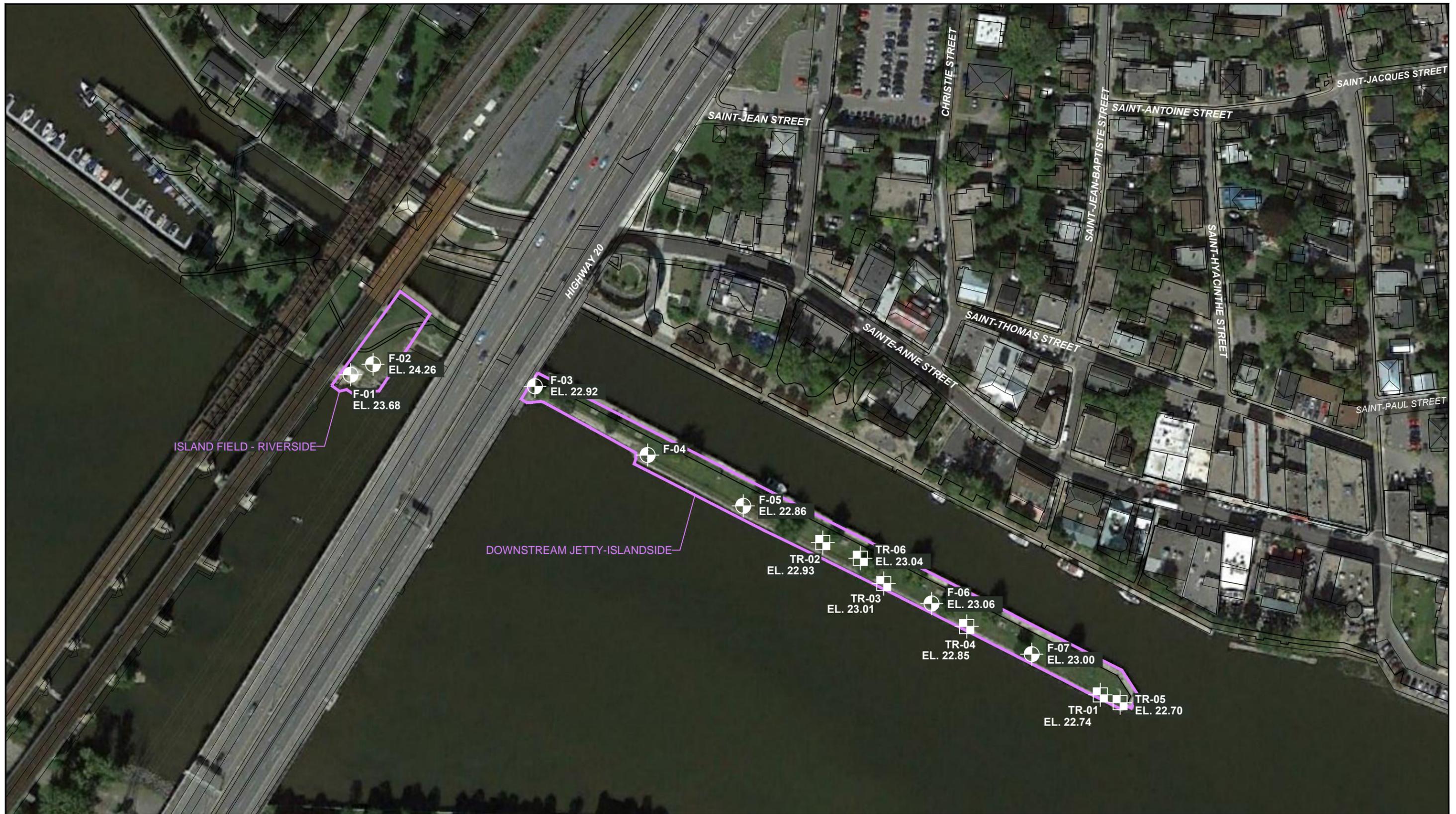
All of Which is Respectfully Submitted,  
GHD

Vincent Jolin Thériault, Eng.

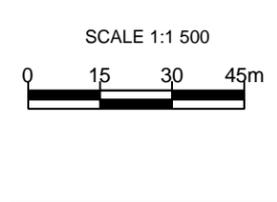
Alexander Fiorilli, Eng.

# Appendices

**Appendix A**  
**Site Location Plan**  
***(Plan No. 11131157-A1-1)***



Source: Données cartographiques © 2015 Google ou Image © 2015 Google, DigitalGlobe.



**LEGEND**

	<b>F-01</b> EL. 23.68	BOREHOLE, NUMBER AND GROUND SURFACE ELEVATION (m)
	<b>TR-01</b> EL. 22.90	TEST PIT, NUMBER AND GROUND SURFACE ELEVATION (m)

NOTE: BOREHOLE No. F-04 WAS CANCELLED

DRAWN BY:  
J. SANTOS

VERIFIED BY:  
V. JOLIN T.



TETRA TECH  
 SAINTE-ANNE-DE-BELLEVUE, QUEBEC  
 RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL

BOREHOLE AND TEST PIT LOCATIONS

11131157-A1  
 Jun 12, 2017

# **Appendix B**

## **Borehole Reports and Rock Photographs**



### A- Soil Sampling

Soil samples are normally recovered with a split-spoon sampler or a thin-walled Shelby tube. The split spoon is dynamically driven into the ground and takes a remoulded sample of the soil found at depth. A standard penetration test is thereby obtained, and is described in the following paragraph. The Shelby tube is pushed into the ground to obtain undisturbed samples of clay or clayey soils. Rock samples are obtained by drilling a core barrel into the rock formation; the diameter of the recovered sample varies with the size of the drilling bit used.

### B- Standard Penetration Test (SPT)

A standard penetration test consists of driving a standard split-spoon sampler into the soil by dropping a 140 lb. weight (63.5 kg) from a height of 30 inches (76 cm). The sampler is driven 18 inches (45 cm) into the soil and the number of blows of the drop weight is recorded for every 6 inches (15 cm) of penetration. The total number of blows for the last 12 inches (30 cm) of penetration is the standard penetration index ("N" value). This value obtained at regular intervals provides vital information from which the density, compressibility and bearing capacity of the various soil horizons can be estimated. The test is however seldom used in clayey soils.

### C- Dynamic Penetration Test

A dynamic penetration test (or cone penetration test) is similar to a standard penetration test with the difference that the split-spoon sampler is replaced by a conical point 10 cm<sup>2</sup> in area. The number of blows is recorded continuously for every foot of penetration (30 cm) thus obtaining a systematic indication of the relative density of the materials encountered at depth. This test also helps in determining the depth to a dense soil horizon or bedrock.

**Note:** The presence of large gravel, cobbles or boulders in the subsoil may distort the results of both the standard penetration test and the dynamic penetration test by giving abnormally high resistance values. When it becomes impossible to drive the cone deeper a refusal ("R") is then recorded.

### D- Shear Test

An undrained shear test may be carried out by pushing into the undisturbed soil a vane shear apparatus consisting of a four-bladed vane connected to a rod and by measuring the torque value required to shear the clay. This test may be repeated at regular intervals and the torque values calculated to obtain the undrained shear strength of the clay at each test level. The shear strength profiles permit the calculation of the allowable bearing capacity of the clay. The apparatus used is the "Nilcon" of Scandinavian origin.

### E- Permeability Test (Lefranc)

This test consists of determining the coefficient of permeability K of the soil around a permeable lens of known dimensions and which has been formed below the driving shoe. The procedure used is the falling head method. Tests of the Lefranc type are carried out in soils with average granulometry and average permeability.

### F- Packer Test

This test is conducted in bedrock by sealing off a section of the borehole with one or two inflatable rubber packers and then pumping water into the isolated section of the hole. The permeability of the rock adjacent to the isolated section of the borehole is measured as a function of the pumping head (pressure) and rate of water loss (absorption) from the sealed-off section over a fixed period of time.

### G- Menard Pressuremeter Test

The pressuremeter test developed by Menard (1956) consists of laterally loading the sidewalls of a borehole by dilating a cylindrical probe. The test permits the determination of the modulus  $E_M$  and the limit pressure  $p_l$ , which are a measure of the strength of the soil, and enables the calculation of the bearing capacity and settlements for foundations.



## Notes on Borehole and Test Pit Reports

### Soil description :

Each subsurface stratum is described using the following terminology. The relative density of granular soils is determined by the Standard Penetration Index ("N" value), while the consistency of clayey soils is measured by the value of undrained shear strength (Cu).

Classification (Unified system)			
Clay	< 0.002 mm		
Silt	0.002 to 0.075 mm		
Sand	0.075 to 4.75 mm	fine	0.075 to 4.25 mm
		medium	0.425 to 2.0 mm
		coarse	2.0 to 4.75 mm
Gravel	4.75 to 75 mm	fine	4.75 to 19 mm
		coarse	19 to 75 mm
Cobbles	75 to 300 mm		
Boulders	>300 mm		

Terminology	
"trace"	1-10%
"some"	10-20%
adjective (silty, sandy)	20-35%
"and"	35-50%

Relative density of granular soils	Standard penetration index "N" value (BLOWS/ft – 300 mm)
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Consistency of cohesive soils	Undrained shear strength (Cu)	
	(P.S.F)	(kPa)
Very soft	<250	<12
Soft	250-500	12-25
Firm	500-1000	25-50
Stiff	1000-2000	50-100
Very stiff	2000-4000	100-200
Hard	>4000	>200

Rock quality designation	
"RQD" (%) Value	Quality
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
>90	Excellent

STRATIGRAPHIC LEGEND			
Sand	Gravel	Cobbles & boulders	Bedrock
Silt	Clay	Organic soil	Fill

### Samples:

#### Type and Number

The type of sample recovered is shown on the log by the abbreviation listed hereafter. The numbering of samples is sequential for each type of sample.

SS: Split spoon

ST: Shelby tube

AG: Auger

SSE, GSE, AGE: Environmental sampling

PS: Piston sample (Osterberg)

RC: Rock core

GS: Grab sample

#### Recovery

The recovery, shown as a percentage, is the ratio of length of the sample obtained to the distance the sampler was driven/pushed into the soil

#### RQD

The "Rock Quality Designation" or "RQD" value, expressed as percentage, is the ratio of the total length of all core fragments of 4 inches (10 cm) or more to the total length of the run.

#### IN-SITU TESTS:

N: Standard penetration index

N<sub>c</sub>: Dynamic cone penetration index

k: Permeability

R: Refusal to penetration

Cu: Undrained shear strength

ABS: Absorption (Packer test)

Pr: Pressure meter

#### LABORATORY TESTS:

I<sub>p</sub>: Plasticity index

H: Hydrometer analysis

A: Atterberg limits

C: Consolidation

O.V.: Organic vapor

W<sub>l</sub>: Liquid limit

GSA: Grain size analysis

w: Water content

CS: Swedish fall cone

W<sub>p</sub>: Plastic limit

y: Unit weight

CHEM: Chemical analysis



# BOREHOLE REPORT

**Borehole No.**

**F-01**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269111.0                  Y : 5029430.4                  Z : 23.68</p>	<p><b>▼ - WATER LEVEL</b>                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
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<p>Borehole type : Casing                  Core bit size : B, N, NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-08                  Date (finish) : 2017-03-09</p>	<p><b>SAMPLE TYPE</b>                  SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<p><b>SAMPLE STATE</b>  <input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input type="checkbox"/> Lost</p>	<p><b>TEST SYMBOL</b>                  GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>
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STRATIGRAPHY				SAMPLE				TESTS RESULTS						
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      △ C <sub>u</sub> (Field, kPa) □ Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value			
0.00	23.68		Ground surface								10 20 30 40 50 60 70 80 90      Water level			
			Concrete slab (880mm)		CR-1	99				99				
1.0	22.80		<b>Fill:</b> Loose to compact, brown sand, some gravel, traces of silt, moist		CF-2 CFE-2 CFE-3	94 34	CA		8-5 (B) 6-1-6-50/8cm (B)	13 7				
2.0	21.93		Grey-pink sandstone gravel		CR-4	29				0				
3.0	20.81		Presence of debris (mortar, concrete fragments, steel)		CF-5 CR-6	50 100			50/8cm (B)	R 0				
	20.39		Grey-beige sandstone gravel		CR-7	61				0				
4.0	20.08		Compact, silt, some clay, traces of gravel and sand, saturated		CF-8 CFE-8	45	CA		37-6-4-3 (B)	10				
	19.41		becoming with presence of debris (wood)		CF-9	26			8-8-8-7 (B)	16				
					CF-10	85			14-10-9-7 (N)	12*				
5.51	18.17		Very loose, grey silt, some clay, traces of sand and gravel, saturated. Presence of debris (wood)		CF-11	7			5-1-2-2 (N)	2*				
	17.45		<b>Bedrock:</b> Pink sandstone, poor rock quality		CF-12	62			50/13cm (N)	R				
7.0					CR-13	74	Co = 278.9 MPa			50				
7.42	16.26		End of borehole											
8.0			Note: * "N" penetration value adjusted according to the size of the split spoon used											
9.0														

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-02**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269120.4                  Y : 5029434.8                  Z : 24.26</p>	<p><b>▼ - WATER LEVEL</b>                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
<p>Borehole type : Auger + Casing                  Core bit size : B, N, NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-08                  Date (finish) : 2017-02-13</p>	<p><b>SAMPLE TYPE</b></p> <p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<p><b>SAMPLE STATE</b></p> <p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input type="checkbox"/> Lost</p>
<p><b>TEST SYMBOL</b></p> <p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>		

STRATIGRAPHY				SAMPLE				TESTS RESULTS											
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      △ C <sub>u</sub> (Field, kPa) □ Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value								
0.00	24.26		Ground surface																
0.29	23.97		<b>Fill:</b> Very dense, brown sand, traces of silt and gravel, moist. Presence of frozen topsoil Dense, grey crushed stone of 20-0mm apparent size, moist Compact, brown gravel and sand, some silt, moist. Presence of debris (mortar)		CF-1A	79			6-36-49-44	85									
							CFE-1A												
							CF-1B				(B)								
							CF-2A	66	CA		8-24-11-10	35							
							CFE-2A				(B)								
							CF-2B				(B)								
							CFE-2B												
							CFE-3	46	GSA		5-4-7-5	11							
									w		(B)								
					becoming loose		CF-4	43			3-3-3-3	6							
							CFE-4				(B)								
					becoming saturated		CF-5	39			2-2-4-1	6							
					CFE-5				(B)										
			becoming compact		CF-6	46			12-20-7-3	27									
					CFE-6				(B)										
					CF-7	10			8-8-5-6	13									
			Loose, grey silt, some gravel, traces of sand, saturated		CF-8	38	CA		4-6-6-10	8*									
					CFE-8				(N)										
			becoming very loose with traces of clay		CF-9	38			2-2-4-3	4*									
					CFE-9				(N)										
			becoming very loose with some clay		CFE-10	44			3-2-2-5	3*									
									(N)										
			becoming dense with presence of debris (wood)		CF-11	56			6-38-23-44	40*									
					CFE-11				(N)										
			<b>Probable bedrock</b>		CF-12	0			50/7cm	R									
			End of borehole						(N)										
			Note: * "N" penetration value adjusted according to the size of the split spoon used																

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-03**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269188.2                  Y : 5029425.6                  Z : 22.92</p>	<p>▼ - WATER LEVEL                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
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<p>Borehole type : Casing                  Core bit size : B+NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-13                  Date (finish) : 2017-03-13</p>	<b>SAMPLE TYPE</b>	<p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<b>SAMPLE STATE</b>	<p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input type="checkbox"/> Lost</p>	<b>TEST SYMBOL</b>	<p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>
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STRATIGRAPHY				SAMPLE					TESTS RESULTS											
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      △ C <sub>u</sub> (Field, kPa) W <sub>p</sub> , W <sub>L</sub> Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value									
0.00	22.92		Ground surface								10 20 30 40 50 60 70 80 90 <b>Water level</b>									
0.10	22.82		Frozen, brown topsoil, moist		CF-1	100	CA		10-49-50/3cm	R										
0.33	22.59		Fill: Frozen, brown sand, traces of silt, moist		CFE-1															
1.0			Concrete slab (710mm)																	
1.04	21.88		Loose, brown sand, some gravel, traces of silt, saturated		CF-2	0			50/4cm	R										
2.0						CF-3 CFE-3	16	CA		4-3-2-2	5									
2.20	20.72		Very loose, grey silt, some clay, traces of sand and gravel, saturated		CF-4	79	GSA w		1-1-2-1	3										
3.0						CF-5 CFE-5	38			13-50/6cm	R									
3.26	19.66		<b>Bedrock:</b> Grey sandstone, good rock quality		CR-6	96	Co = 309.4 MPa			89										
4.54	18.38			End of borehole																

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-05**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269275.6                  Y : 5029375.6                  Z : 22.86</p>	<p><b>▼ - WATER LEVEL</b>                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
<p>Borehole type : Casing                  Core bit size : B, N, NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-09                  Date (finish) : 2017-03-09</p>	<p><b>SAMPLE TYPE</b></p> <p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<p><b>SAMPLE STATE</b></p> <p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input type="checkbox"/> Lost</p>
<p><b>TEST SYMBOL</b></p> <p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>		

STRATIGRAPHY				SAMPLE				TESTS RESULTS						
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)    △ C <sub>u</sub> (Field, kPa) W <sub>p</sub> , W <sub>L</sub> Atterberg limits (%)    □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value			
0.00	22.86		Ground surface								10 20 30 40 50 60 70 80 90 <b>Water level</b>			
0.07	22.79		Frozen, brown topsoil, moist		CF-1A		CA							
0.33	22.53		<b>Fill:</b> Frozen, brown silty sand, traces of gravel, moist		CFE-1A CF-1B CF-1C	75			8-40-45-20 (B)	85				
0.79	22.07		Very dense, brown sandstone cobbles, traces of sand, moist		CFE-1C CF-2	13	GSA w		10-6-12-12 (B)	18				
1.22	21.64		Compact, brown sandy gravel, traces of silt, saturated becoming dense		CF-3 CFE-3	54	CA		9-22-19-21 (B)	41				
1.83	21.03		becoming compact		CF-4	21			19-12-9-9 (N)	14*				
2.44	20.42		becoming loose		CF-5	13			8-9-4-3 (N)	8*				
2.79	20.07		Dense, grey sandy gravel, some silt, saturated		CF-6	41	GSA w		5-19-20-10 (B)	39				
3.66	19.20		becoming compact with presence of debris (wood)		CF-7	10			8-4-6-7 (B)	10				
4.88	17.98		becoming loose to compact		CF-8 CF-9	36 25			16-11-14-8 (N) 11-5-7-9 (N)	16* 8*				
6.10	16.76		Compact, grey gravellt silt, saturated. Presence of debris (wood)		CF-10 CR-11	21 60			8-9-6-4 (N)	10*				
6.65	16.21		<b>Bedrock:</b> Beige-grey sandstone, poor rock quality		CR-12	100	Co = 72.7 MPa			36				
8.33	14.53		End of borehole		CR-13	100				23				
9.0			Note: * "N" penetration value adjusted according to the size of the split spoon used											

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-06**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES (MTM, NAD-83) (m)</b>                  X : 269354.5                  Y : 5029334.8                  Z : 23.06</p>	<p><b>▼ - WATER LEVEL</b>  <b>Date :</b>  <b>Depth (m) :</b></p> <p><b>Location plan :</b> 11131157-A1-1</p>
<p><b>Borehole type :</b> Casing  <b>Core bit size :</b> B, N, NQ  <b>Hammer type :</b> Automatic  <b>Energy ratio :</b>  <b>Date (start) :</b> 2017-03-10  <b>Date (finish) :</b> 2017-03-13</p>	<p><b>SAMPLE TYPE</b></p> <p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<p><b>SAMPLE STATE</b></p> <p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input checked="" type="checkbox"/> Lost</p>
<p><b>TEST SYMBOL</b></p> <p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>		

STRATIGRAPHY				SAMPLE				TESTS RESULTS						
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      Δ C <sub>u</sub> (Field, kPa) □ Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value			
0.00	23.06		Ground surface								10 20 30 40 50 60 70 80 90 <b>Water level</b>			
0.06	23.00		Frozen, brown topsoil, moist		CFE-1	100	CA		50/13cm (B)	R				
			<b>Fill:</b> Compact, brown gravel, some sand, traces of silt, moist											
1.0					CF-2	23			28-12-5-7 (N)	11*				
1.20	21.86		becoming saturated		CFE-2									
2.0					CF-3	20	GSA w		13-12-8-20 (N)	13*				
2.28	20.78		becoming loose with presence of debris (wood)		CF-4	7			3-3-9-8 (N)	8*				
3.0	20.16		Piece of wood		CF-5	79			6-34-28-22 (N)	41*				
3.58	19.48		Presence of cobbles											
3.69	19.37		Very dense, brown sand, some gravel, traces of silt, saturated		CF-6	31			50/13cm (N)	R				
4.19	18.87		Beige sandstone blocks		CR-7	59				0				
4.43	18.63		Brown gravelly sand, traces of silt, saturated		CF-8	80			50/10cm	R				
4.67	18.39		<b>Bedrock:</b> Beige sandstone, poor rock quality											
5.35	17.71		Grey clayey limestone		CR-9	79				36				
5.51	17.55		Beige sandstone, poor rock quality											
6.19	16.87		End of borehole											
7.0			Note: * "N" penetration value adjusted according to the size of the split spoon used											

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-07**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269396.4                  Y : 5029313.6                  Z : 23.00</p>	<p><b>▼ - WATER LEVEL</b>                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
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<p>Borehole type : Casing                  Core bit size : B, N, NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-10                  Date (finish) : 2017-03-10</p>	<b>SAMPLE TYPE</b>	<p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<b>SAMPLE STATE</b>	<p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input type="checkbox"/> Lost</p>	<b>TEST SYMBOL</b>	<p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>
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STRATIGRAPHY				SAMPLE					TESTS RESULTS					
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      △ C <sub>u</sub> (Field, kPa) W <sub>p</sub> , W <sub>L</sub> Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value			
0.00	23.00		Ground surface								10 20 30 40 50 60 70 80 90 <b>Water level</b>			
0.08	22.92		Frozen, brown topsoil, moist	X	CF-1	66	CA		8-34-30-25 (B)	64				
1.0			Fill: Compact to dense, brown silty sand, some gravel, moist. Presence of cobbles	X	CFE-1									
1.20	21.80		becoming saturated	X	CF-2	21			10-14-9-3 (B)	23				
1.44	21.56		becoming dense, gravelly with traces of silt	X	CF-3	36	CA		22-24-35-21 (N)	39*				
2.28	20.72		becoming compact	X	CFE-3									
3.0				I	CF-4	10			12-13-7-9 (N)	13*				
3.81	19.19		Compact, brown to grey sandy gravel, traces of silt, saturated	X	CR-5	44			0/18cm	R				
4.57	18.43		becoming with some gravel	X	CF-6	0			50/15cm (B)					
5.10	17.90		Grey clayey limestone blocks	I	CF-7	59	CA GSA w		34-15-28-16 (N)	28*				
4.57	18.43		becoming with some gravel	X	CF-8	85	CA		8-16-50/3cm (N)	R				
5.10	17.90		Grey clayey limestone blocks	I	CR-9	31								
6.06	16.94		<b>Probable bedrock</b>	I										
6.10	16.90		End of borehole	I										
7.0			Note: * "N" penetration value adjusted according to the size of the split spoon used											

See the attached explicative note for the complete list of symbols and abbreviations



Photo 1 – Rock sampled in F-01



Photo 2 – Rock sampled in F-03



## Rock Core Photographs



Photo 3 – Rock sampled in F-05



Photo 4 – Rock sampled in F-06, run CR-9 (4.67-6.19m)



## Rock Core Photographs

# **Appendix C**

## **Test Pit Reports and Wall Photographs**



**TEST PIT REPORT**

**TEST PIT No.**

**TR-01**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269425.2 Y : 5029296.6 Z : 22.74	< - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type		Manual tests
DATE: 2017-03-09	CA : Chemical analysis	PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon	AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core	GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> )
			GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	22.74					
0.05	22.69		<b>Topsoil</b> <b>Fill:</b> Frozen, brown sandy silt			
0.18	22.56		Crushed stone of 20-0mm apparent size, some sandy silt. <1% of debris (wood, glass)			
0.5	0.48	22.26		Gravelly sand and silt 5-10% of cobbles and boulders	VR-1 VRE-1	CA
1.0						
					VR-2	w = 15.0% GSA
1.20	21.54		End of test pit  Note: Strong water infiltration at 1.15m depth			<
1.5						
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-02**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269308.9 Y : 5029360.3 Z : 22.93	< - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type		Manual tests
DATE: 2017-03-09	CA : Chemical analysis	PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon	AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core	GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> )
			GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	22.93					
0.05	22.88		<b>Topsoil</b> <b>Fill:</b> Brown sandy and gravelly silt 15-20% of cobbles and boulders	VR-1 VRE-1	CA	<
0.5						
1.0				VR-2 VRE-2		<
1.5	21.43		End of test pit  Note: Strong water infiltration at 1.20m depth			
1.50						
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-03**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269334.4 Y : 5029343.1 Z : 23.01	← - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type	Manual tests
DATE: 2017-03-08	CA : Chemical analysis PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> ) GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	23.01					←
0.05	22.96		<b>Topsoil</b> <b>Fill:</b> Brown silty sand, some gravel. <1% of debris (glass, metal)			
0.30	22.71		becoming with 35-40% of cobbles and boulders			
0.5						
1.0				VR-1	w = 14.0% GSA CA	
1.5	21.51		End of test pit  Note: Strong water infiltration at 1.35m depth			←
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-04**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269369.2 Y : 5029325.2 Z : 22.85	< - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type		Manual tests
DATE: 2017-03-08	CA : Chemical analysis	PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon	AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core	GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> )
			GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	22.85					
0.05	22.80		<b>Topsoil</b>	VR-1		
0.15	22.70		<b>Fill:</b> Frozen, brown sandy silt. <1% of debris (glass, metal) Brown sandy and gravelly silt 35-40% of cobbles and boulders	VRE-1		
0.5				VR-2	w = 13.0% GSA CA	
1.0						
1.5	21.35		End of test pit  Note: Strong water infiltration at 1.30m depth			
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-05**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269433.5 Y : 5029293.3 Z : 22.70	← - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type	Manual tests
DATE: 2017-03-08	CA : Chemical analysis PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> ) GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	22.70					
0.05	22.65		<b>Topsoil</b> <b>Fill:</b> Frozen, brown sandy silt	VR-1 VRE-1		
0.25	22.45		Crushed stone of 20-0mm apparent size  - Presence of block (Ø 30 to 50cm) at 0.4m depth	VR-2	w = 9.0% GSA	
1.00	21.70		Brown-grey sandy silt, some gravel to gravelly 10-15% of cobbles and boulders	VR-3 VRE-3	CA	
1.80	20.90		End of test pit  Note: - Strong water infiltration at 1.65m depth - Presence of steel frame at 0.7m and 1.05m depth			

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-06**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269324.6 Y : 5029353.7 Z : 23.04	← - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type	Manual tests
DATE: 2017-03-09	CA : Chemical analysis PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> ) GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	
					Type	▼
0,0	23.04					←
0.05	22.99		<b>Topsoil</b> <b>Fill:</b> Brown gravelly and sandy silt. 5-10% of cobbles and boulders Presence of debris (wood, steel frame, electrical wire)			
1.20	21.84		End of test pit			
0.5						
1.0						
1.5						
2.0						
2.5						



Photo 1 – Test pit TR-01 – Concrete and stone block wall junction



## Test Pit Photos



Photo 2 – Test pit TR-02 – Concrete installation with steel rod



## Test Pit Photos

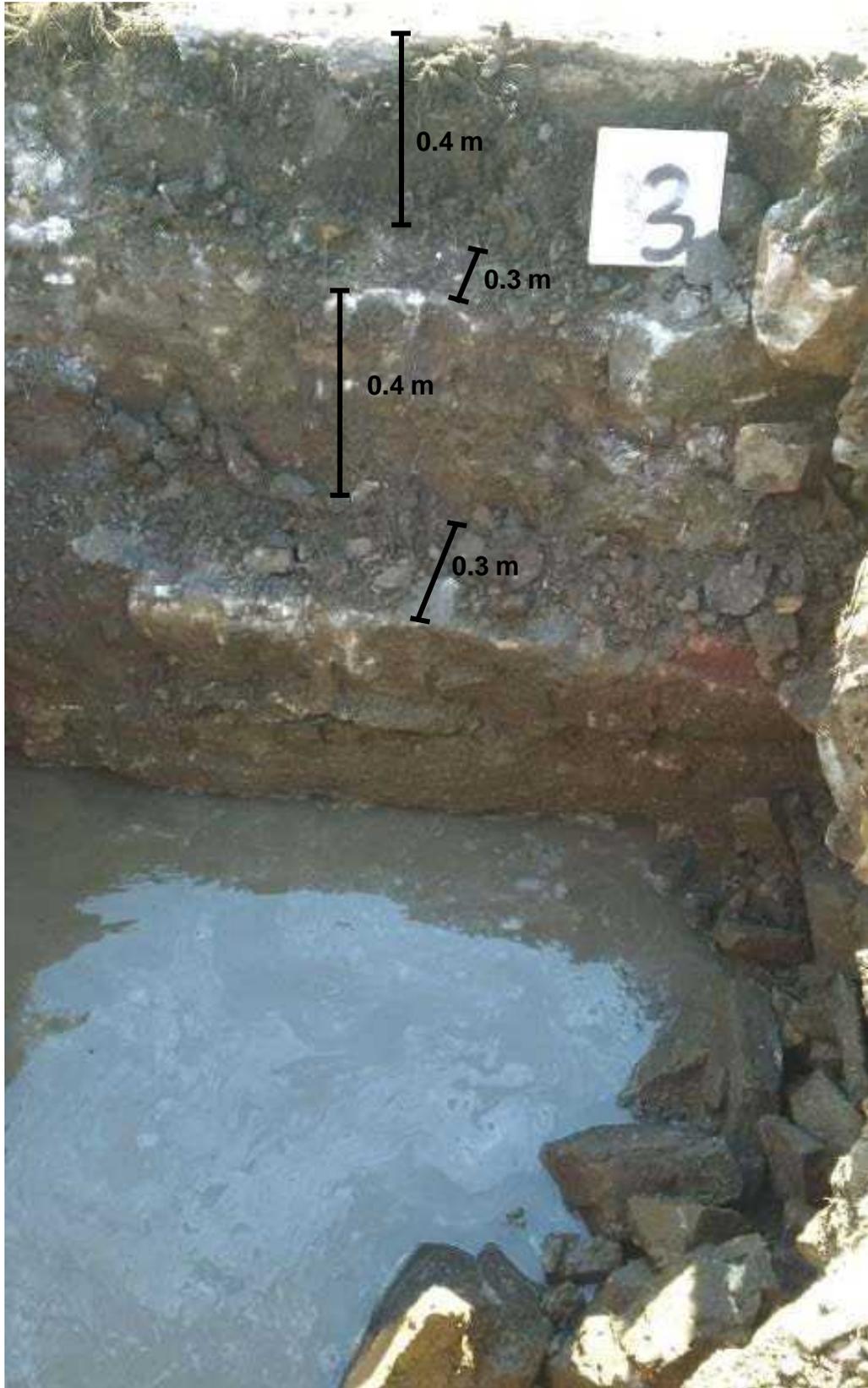


Photo 3 – Test pit TR-03 – Stone block wall

## Test Pit Photos





Photo 4 – Test pit TR-04 – Stone block wall



## Test Pit Photos



Photo 5 – Test pit TR-05 – Concrete wall with steel rods



## Test Pit Photos

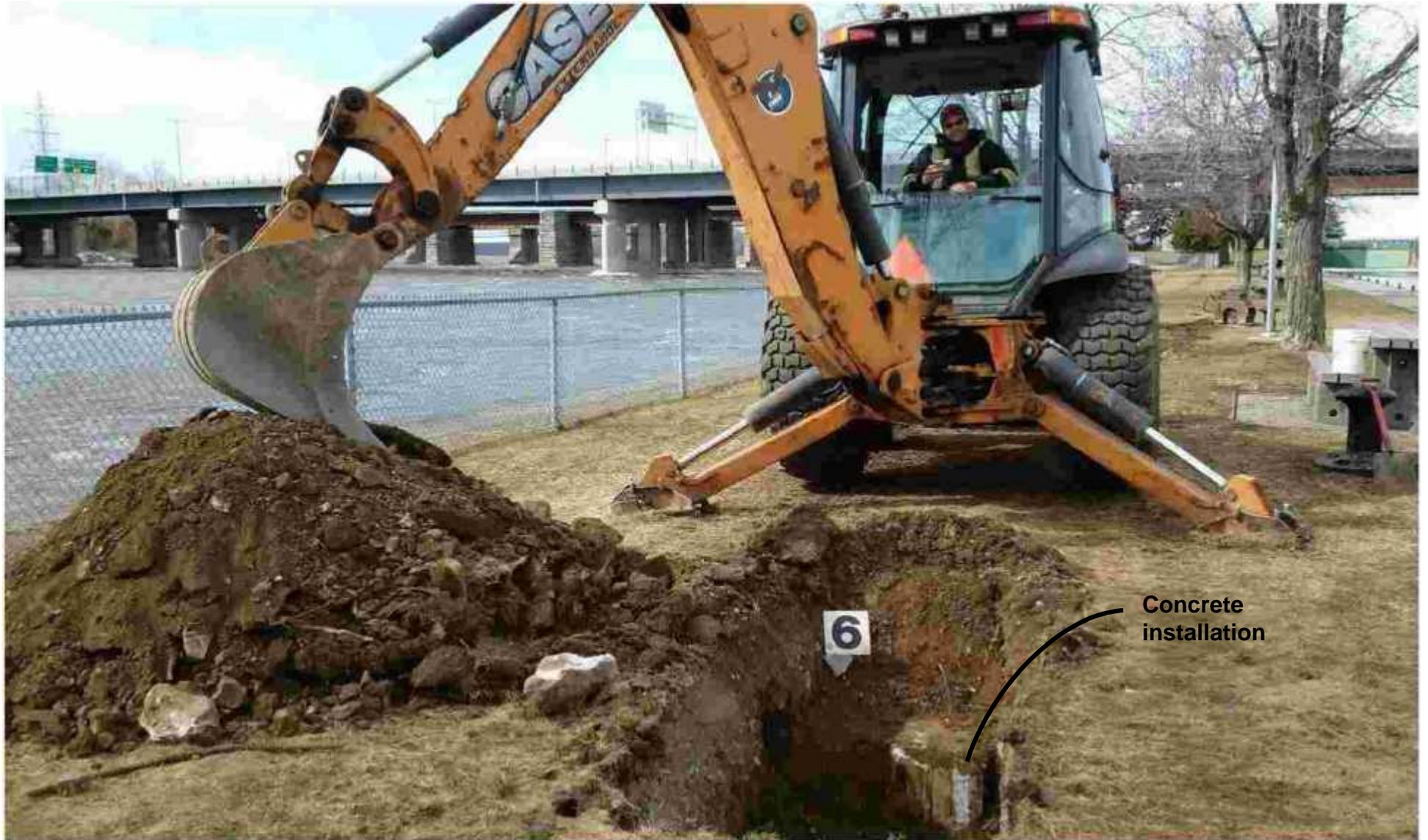


Photo 6 – Test pit TR-06 – Concrete installation



## Test Pit Photos

# **Appendix D**

## **Laboratory Test Reports**



**Unconfined Compressive Strength of Intact Rock Core Specimen  
ASTM D 7012, ASTM D 4543**

<b>Client :</b> <u>Tetra Tech</u>	<b>Project N° :</b> <u>11131157-A1</u>
<b>Project :</b> <u>Geotechnical study and environnemental caracterisation</u>	<b>Sample N° :</b> <u>F-01 / CR-13</u>
<u>Rehabilitation of the downstream walls of the Sainte-Anne-de-Bellevue</u>	<b>Depth :</b> <u>6.49-6.60 m</u>
<u>canal, Sainte-Anne-de-Bellevue, Québec</u>	<b>Sampling Date :</b> _____

**Testing Apparatus Used :** Loading device N° 500QCP9804 Caliper N° 2488

Technical Data	View of Specimen																																				
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	Average																																				
Diameter :	47.5	47.5	47.5	47.5	(mm)																																
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**Remarks :** \_\_\_\_\_

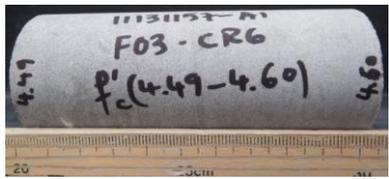
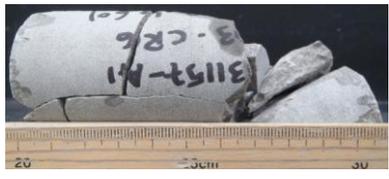
<b>Analysed by :</b> <u>A. Zerhoudi</u>	<b>Date :</b> <u>27-Mar-17</u>
<b>Verified by :</b> <u>Andrée-Anne Hinse, B. Sc. Géologie.</u> 	<b>Date :</b> <u>27-Mar-17</u>



**Unconfined Compressive Strength of Intact Rock Core Specimen  
ASTM D 7012, ASTM D 4543**

<b>Client :</b> <u>Tetra Tech</u>	<b>Project N° :</b> <u>11131157-A1</u>
<b>Project :</b> <u>Geotechnical study and environmental characterisation</u>	<b>Sample N° :</b> <u>F-03 / CR-6</u>
<u>Rehabilitation of the downstream walls of the Sainte-Anne-de-Bellevue</u>	<b>Depth :</b> <u>4.49-4.60 m</u>
<u>canal, Sainte-Anne-de-Bellevue, Québec</u>	<b>Sampling Date :</b> _____

**Testing Apparatus Used :** Loading device N° 500QCP9804 Caliper N° 2488

Technical Data	View of Specimen																																				
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**Remarks :** \_\_\_\_\_

<b>Analysed by :</b> <u>A. Zerhoudi</u>	<b>Date :</b> <u>27-Mar-17</u>
<b>Verified by :</b> <u>Andrée-Anne Hinse, B. Sc. Géologie.</u> <i>Ame</i>	<b>Date :</b> <u>27-Mar-17</u>



**Unconfined Compressive Strength of Intact Rock Core Specimen  
ASTM D 7012, ASTM D 4543**

<b>Client :</b> <u>Tetra Tech</u>	<b>Project N° :</b> <u>11131157-A1</u>
<b>Project :</b> <u>Geotechnical study and environmental characterisation</u>	<b>Sample N° :</b> <u>F-05 / CR-12</u>
<u>Rehabilitation of the downstream walls of the Sainte-Anne-de-Bellevue</u>	<b>Depth :</b> <u>7.25-7.36 m</u>
<u>canal, Sainte-Anne-de-Bellevue, Québec</u>	<b>Sampling Date :</b> _____

**Testing Apparatus Used :** Loading device N° 500QCP9804 Caliper N° 2488

Technical Data	View of Specimen																																				
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	Average																																				
Diameter :	47.4	47.4	47.5	47.4	(mm)																																
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**Remarks :** \_\_\_\_\_

<b>Analysed by :</b> <u>A. Zerhoudi</u>	<b>Date :</b> <u>27-Mar-17</u>
<b>Verified by :</b> <u>Andrée-Anne Hinse, B. Sc. Géologie.</u> <i>AH</i>	<b>Date :</b> <u>27-Mar-17</u>





# GRAIN SIZE ANALYSIS REPORT

REFERENCE No. : 11131157-A1

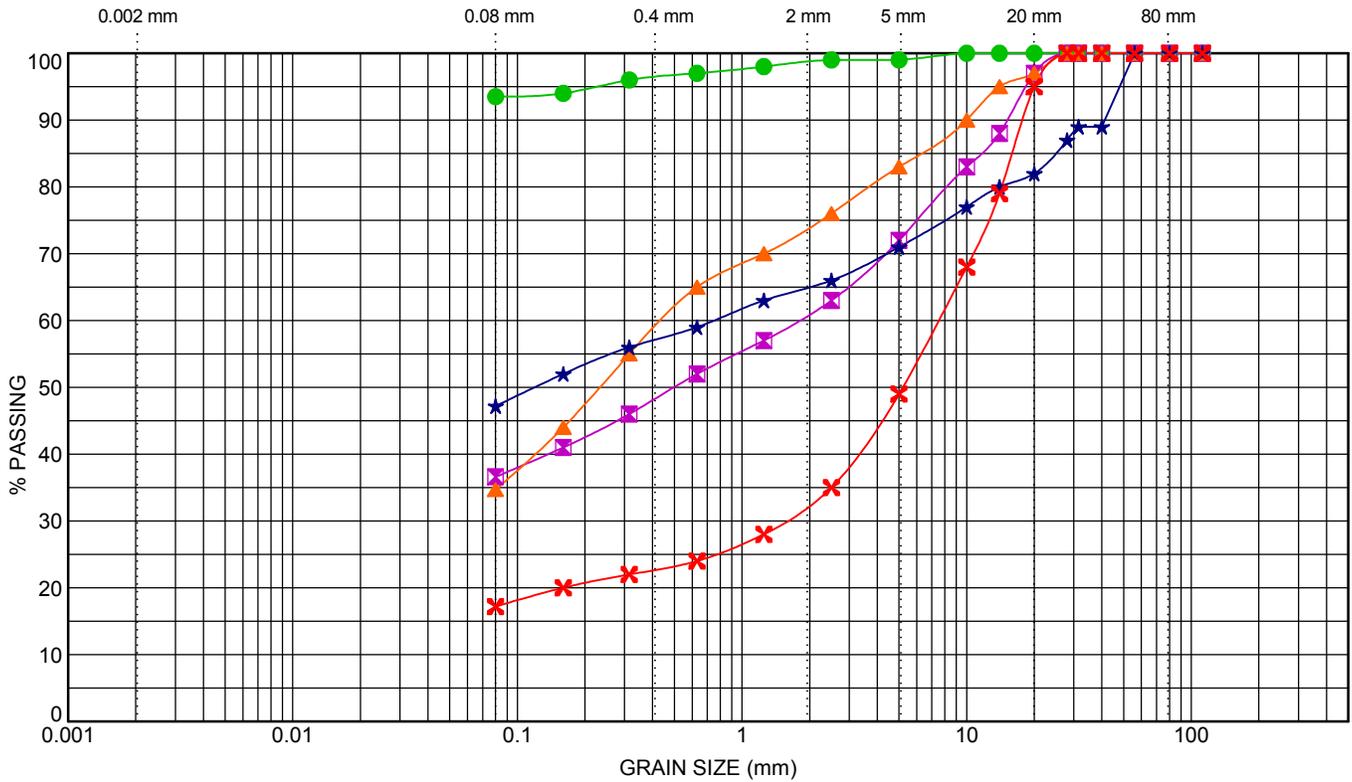
CLIENT : TETRA TECH

LOCATION : SAINTE-ANNE-DE-BELLEVUE, QUEBEC

PROJECT : RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL

DATE : 3/24/2017

UNIFIED SOIL CLASSIFICATION (BASED ON THE STANDARD LC 21-040)



CLAY	SILT	SAND			GRAVEL		COBBLES AND BOULDERS
		fine	medium	coarse	fine	coarse	

	Bore No.	Sample No.	Depth (m)	Description	w (%)	W <sub>L</sub> (%)	I <sub>p</sub> (%)	Classification (1)
●	F-03	CF-4	2.28	Silt, some clay, traces of sand and gravel	55			ML
◻	TR-01	VR-2	1.00	Gravelly silt and sand	15			ML
▲	TR-03	VR-1	0.05	Silty sand, some gravel	14			SM-SC
★	TR-04	VR-2	0.15	Sandy and gravelly silt	13			ML
✕	TR-05	VR-2	0.25	20-0mm calibre crushed stone	9			GM-GC

(1)

	Bore No.	Sample No.	% Gravel	% Sand	% Silt and % Clay	c <sub>u</sub>	c <sub>c</sub>	D85	D60	D50	D30	D15	D10
●	F-03	CF-4	1	6	94								
◻	TR-01	VR-2	28	35	37								
▲	TR-03	VR-1	17	48	35								
★	TR-04	VR-2	29	24	47								
✕	TR-05	VR-2	51	32	17								

Prepared by : Lynne Geoffré

Verified by : Mark Gamboz, B.Sc. Geology

[www.ghd.com](http://www.ghd.com)





This report is a translation of an original French document produced for the Client. In case of disparity or of any interpretation variations, the original French text is to be considered as exact.



## Environmental Site Characterization of Soils

Reconstruction of the Sainte-Anne-de-Bellevue Channel Retaining Wall

Sainte-Anne-de-Bellevue, Quebec

Tetra Tech File No.: 29501TTG

TPSGC File No.: R.077243.400

Tetra Tech Inc.

**GHD** | 4600 de la Côte-Vertu Boulevard Montreal Quebec H4S 1C7 Canada

11131157 | E1 | Report No. 2 | March 27<sup>th</sup>, 2018



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- Appendix A     Site and Sounding Location Plan (11131157-E1-1)  
                    Interpretation of Contamination (11131157-E1-2)
- Appendix B     Borehole and Test Pit Reports
- Appendix C     CEAEQ Quality Control Table (in French)
- Appendix D     Certificates of Chemical Analyses (Maxxam Analytique Inc.) (in French)



# 1. Introduction

The professional services of GHD were retained by the firm Tetra Tech (Client), represented by Mr. Jonathan Renaud, Eng., to conduct an environmental characterization of soils in the scope of the partial reconstruction project at the Saint-Anne-de-Bellevue Canal, in Saint-Anne-de-Bellevue, Quebec. This report covers the environmental characterization of soils only. A separate report covering the geotechnical study has been emitted (Reference No.:11131157-A1, May 16<sup>th</sup>, 2017).

The terms applicable to this present mandate are presented in the offer of services dated February 22<sup>nd</sup>, 2017 Reference No.:11118182-98-A1.

According to the information provided in the document titled “*Demande de proposition de services professionnels – Étude géotechnique et caractérisation environnementale des sols – Révision 02*”, dated February 22<sup>nd</sup> 2017, the project consists of the reconstruction and/or rehabilitation of the following structures:

- Upstream Jetty – Sainte-Anne Street
- Island Field – Channelside
- Downstream Jetty – Islandside
- Island Field – Riverside

The two (2) structures concerned in this study are the “Downstream Jetty – Islandside” and the “Island Field – Riverside”.

The objective of this environmental study was to evaluate the environmental quality of the soils in the afore-mentioned sectors in order to determine the management and disposal of soils off-site.

The following work program was carried out within the scope of the present mandate:

- Advancement of boreholes and test pits in order to verify the environmental quality of soils;
- Collection of soil samples following guidelines outlined by the MDDELCC and the CCME;
- Chemical analysis of a selection of soil samples;
- Interpretative and qualitative assessment of analytical results in terms of criteria outlined by the MDDELCC and by the CCME;
- Preparation of a technical report.

This report includes a brief description of the Site, details of the fieldwork, soil descriptions, an outline of the chemical analyses performed, the presentation of results and the corresponding conclusions. It also includes one four (4) appendices. Appendix A consists of a Site plan depicting a general view of the entire property as well as the location of the soundings and the contamination interpretation. Appendix B contains the field log for the soundings. Appendix C contains a summary of the chemical analyses as well as a quality control table. Appendix D contains copies of the Certificates of Chemical Analysis.



This report is subject to certain limitations that are a consequence of problems inherent to environmental contamination phenomena. The scope of the study conducted and its applicable limitations are stated at the end of the technical text. These limitations are an integral part of this report and the reader is asked to be aware of them in order to facilitate the understanding, interpretation and usage of this document.

## 2. Site Description

The worksite is located in the Sainte-Anne-de-Bellevue Channel National Historic Park in Sainte-Anne-de-Bellevue, Quebec. The worksite is occupied by several zones and structures. However, only the “Downstream Jetty – Islandside” and the “Island Field – Riverside” structures, located in the eastern part of the worksite, are concerned within the present study.

The “Island Field – Riverside” structure, located in the western part of the Galipeau Bridge, sits roughly 0.6 m above the river.

The majority of the works were carried out on the “Downstream Jetty – Islandside”, east of the Galipeau Bridge. In terms of topography the jetty is relatively flat, with an elevation of roughly 22.9 m. The jetty has an approximate length of 330 m and is flanked by water on both sides.

A retaining wall with an approximate length of 250 m exists along the southern side of the eastern part of the jetty. The wall consists of a section of concrete and stone blocks.

During fieldwork, the water level around the jetty had an elevation of approximately 21.7 m, or 1.2 m below the top of the jetty.

## 3. Methodology

### 3.1 Field Work

The fieldwork was carried out between February 28<sup>th</sup> and March 13<sup>th</sup>, 2017 under the constant supervision of a GHD site representative. The work program included the advancement of six (6) boreholes, F-01 to F-03, and F-05 to F-07, six (6) test pits TR-01 to TR-06, soil sampling and a site survey report.

Please note that borehole F-04 which was initially proposed was not completed as per time constraints and at the request of the Client.

Prior to conducting the fieldwork, an underground service check was undertaken for the Site. In addition, Promark - Telecon Inc., a specialized firm in the detection of underground services, was mandated to verify the location of each sounding, which was positioned on Site by a GHD technical representative as a function of the location of the underground services and physical limits.



Each borehole was positioned on Site by a GHD technical representative as a function of the location of the underground services and physical limits as follows:

- Boreholes F-01 and F-02 were positioned on the Island Field - Riverside;
- Boreholes F-03 and F-05 to F-07 and the test pits TR-01 to TR-06 were positioned on the downstream jetty located on the Island.

Please note that the work realized (nature, positioning and depths of the soundings) was established by the client. A general view of the site and the positioning of the soundings are presented on plan no 11131157-E1-2 in appendix A. The sounding logs are presented Appendix B.

### 3.2 Soundings

The boreholes were drilled by means of a track-mounted CME-55 hollow-stem auger drill rig equipped for soil and rock sampling and reached final depths varying between 4.54 and 8.33 m.

Test pits were excavated using a backhoe and reached depths varying between 1.20 and 1.80 m. All test pits except for test pit TR-06 showed strong water infiltration. The lack of water infiltration observed in test pit TR-06 is due in part by the fact that it was carried out with the primary objective of determining the presence and dimensions of shallow concrete installations.

A concrete installation was found during the excavation of test pit TR-02 along with a steel rod at an approximate depth of 2.0 m.

Finally, criss-crossing steel rods with diameters of roughly 5 cm were also found within test pit TR-05 at depths of approximately 0.7 to 1.05 m.

Test pit TR-06 revealed the presence of a concrete installation with a steel frame at a depth of approximately 0.6 m.

### 3.3 Sample Management

The GHD technical representative was at all times responsible for handling the samples collected. A rigorous sample management procedure was followed over the course of this study. The management procedure complies with various MDDELCC requirements outlined in its publication entitled "*Guide d'échantillonnage à des fins environnementales*" relating to sample collection, sample identification, temporary storage and safe transportation of samples to the analytical laboratory.

In each of the boreholes, soil sampling was conducted in a continuous manner using a split-spoon sampler that, prior to each sample, was brushed with tap water and detergent, then successively rinsed with distilled water, acetone, hexane, acetone and finally with distilled water.

All samples were immediately placed in new, glass, laboratory supplied, non-reactive containers, sealed with aluminum foil and airtight plastic lids. The containers were filled so as to limit evaporation and contact with the atmosphere in order to avoid the loss of volatile organic compounds, if any were present.



Soil samples were collected from the sidewalls of each excavation using stainless steel trowels. A clean dedicated trowel was used for each soil sample collected. The samples were collected after removing a few centimeters of soil or residual material, from the surface of each sidewall. The samples that were to be analyzed for VOCs were carefully collected using a dedicated cut off syringe for each sample, provided by Maxxam Analytique Inc. (Maxxam).

Each collected soil sample was clearly identified with a label indicating the number of the test-pit, well or ditches, the sample number or/and the depth of recovery and the date of sampling. In the field, the samples were temporarily placed in containers in a cool environment, i.e., at a temperature maintained at about 4°C, in a secure location. At the end of each day on Site, all collected samples were taken to the GHD laboratory and were kept cool in refrigerators, at about 4°C, until their transport to the analytical laboratory.

## 4. Soil Description

Detailed subsurface conditions encountered at each borehole location are presented within the borehole reports included in Appendix B of this report.

Table 4.1 below presents an overview of the depth and elevation of each subsurface stratum encountered at the borehole locations.

Table 4.1 Stratigraphic Summary - Depth (Elevation) in meters (m)

Borehole No.	Borehole Elevation	Topsoil Thickness	Fill Layer Thickness	Bedrock
F-01	23.68	--	5.35*	6.23 (17.45)
F-02	24.26	--	6.63	6.63 (17.63)**
F-03	22.92	0.10	3.16	3.26 (19.66)
F-05	22.86	0.07	6.58	6.65 (16.21)
F-06	23.06	0.06	4.61	4.67 (18.39)
F-07	23.00	0.08	5.98	6.06 (16.94)**

Notes: --: Material not encountered

\*: A concrete installation with a thickness of 0.8 mm encountered below the fill layer

\*\* : Probable bedrock

The stratigraphy of the test pits was not presented in the above table because each test pit revealed only the presence of a fill layer, which is insufficient to confirm its total thickness relative to the overall stratigraphy.

## 5. Groundwater

Water infiltration was observed at different depths and with varying intensities in the majority of the test pits conducted. Table 5.1 below presents the test pit water infiltration depth measurements.



Table 5.1 Test Pit Water Infiltration Observations

Test Pit No.	Water Infiltration – Depth m (elevation)
TR-01	1.15 (21.59)
TR-02	1.20 (21.73)
TR-03	1.35 (21.66)
TR-04	1.30 (21.55)
TR-05	1.65 (21.05)
TR-06	No infiltration observed

The water infiltration level in the test pits generally coincide with the height of the river surface.

## 6. Chemical Analyses

### 6.1 Analytical Program

In total, twenty (20) soil samples were selected and submitted for chemical analysis of all of the following parameters: petroleum hydrocarbons (C<sub>10</sub> to C<sub>50</sub>), polycyclic aromatic hydrocarbons (PAHs), metals (scan of 13), Volatile Organic Compounds (VOCs) and Phenols.

The choice of samples to be analyzed is based on the potential environmental risk identified in each sampling location, such as the presence of hydrocarbon odors, visual evidence of contamination or presence of debris noted during sampling or stratigraphic position.

Table 6.1 below presents the results of the ten (10) grain-size distribution analyses carried out on ten (10) representative samples in the laboratory.

Table 6.1 Fill Layer Grain-size Distribution Results

Sounding No.	Sample No.	Depth (m)	Water Content (%)	Grain-size Distribution (%)		
				Gravel	Sand	Silt and Clay
				> 4,75 mm	4,75 mm – 0,075 mm	< 0,075 mm
TR-01	VR-2	1.0-1.20	15	28	35	37
TR-03	VR-1	0.05-1.50	14	17	48	35
TR-04	VR-2	0.05-1.00	13	29	24	47
TR-05	VR-2	0.25-1.00	9	51	32	17
F-02	CF-3	1.22-1.83	2	43	39	18
F-03	CF-4	2.28-2.89	55	1	6	94
F-05	CF-2	0.61-1.22	6	75	21	4
F-05	CF-6	3.05-3.66	19	63	26	11
F-06	CF-3	1.52-2.13	4	85	13	2
F-07	CF-7	3.81-4.42	11	71	24	6



Overall, the fill can be categorized as generally coarse, loose to compact, with N-values generally below 30.

## 6.2 Chemical Laboratory

All chemical analyses were performed by Maxxam Analytique Inc. (Maxxam), a recognized, MDDELCC certified chemical laboratory. The analyses were performed in accordance with the "*Guide des méthodes de conservation et d'analyses des échantillons d'eau et de sol*", published by the MDDELCC. The Certificates of Chemical Analysis issued by Maxxam for the samples submitted are enclosed in Appendix D.

Maxxam maintains a strict protocol for internal quality control to ensure that the analytical methods and results are reliable. The protocol includes the use of internal duplicate tests, sample blanks, matrix spikes and surrogates, which are presented in the Certificates of Chemical Analysis provided in Appendix D of this report.

## 6.3 Interpretation Criteria

### 6.3.1 Federal Criteria

The recommendations at the Federal level are recommendations emitted by the CCME for soil quality, more specifically, for a Parkland Site as the one currently under study.

For benzene, the recommended criteria chosen was that of excessive risk of cancer during lifetime ( $10^{-5}$ ) due to the depth of the samples submitted for analysis. With respect to PAHs, the recommendations for the protection of the environment founded on the non-carcinogenic effects were used when such existed. If not, provincial limits for naphthalene and phenanthrene were used as described in the literature provide on the subject of PAHs.

Given the nature of the sampled soils and the results of the granulometric analysis, the soils on the Site are primarily made up of coarse grained soils. Consequently, for benzene, ethylbenzene, toluene and xylenes, the compared Federal criteria was that for soils of coarsely grained composition.

Certain parameters analyzed are neither governed by MDDELCC criteria or CCME recommendation.

A table showing the results obtained and the MDDELCC and CCME criteria is presented in Appendix C.

### 6.3.2 Management of Contaminated Soils

The analytical results of the soil samples submitted for chemical analysis were also interpreted respectively using the "*Grille des critères génériques pour les sols (Grille) du Guide d'intervention – Protection de sols et réhabilitation des terrains contaminés (Guide d'intervention)*" of MDDELCC in order to determine their off-site disposal during the eventual site work.

The results were also compared to the RESC (*Règlement sur l'enfouissement des sols contaminés*) limit values.



## 6.4 Results of Chemical Analysis of Soils

### 6.4.1 Federal Criteria

Based on the results obtained, soils coming from soundings F-01 CFE-8, F-02 CFE-8, F-03 CFE-4, TR-02 VRE-1 and TR-05 VRE-3 surpass the recommended limits given by the CCME for metals, as shown in Table 6.2 below. These soils are therefore not suitable for the current site usage.

Table 6.2 Concentrations of Metals in Sampled Soils

Analyzed Parameters	CCME Recommendation	Sounding				
		F-01 CFE-8	F-02 CFE-8	F-03 CFE-4	TR-02 VRE-1	TR-05 VRE-3
(concentration in ppm)						
Chrome (Cr)	64	100	---	77	---	---
Cobalt (Co)	50	---	540	---	---	---
Copper (Cu)	63	---	8300	---	80	---
Tin (Sn)	50	---	200	---	---	55
Molybdenum (Mo)	10	---	76	---	---	---
Nickel (Ni)	45	59	310	48	---	---
Zinc (Zn)	200	---	5700	---	---	---

All other samples analyzed were inferior to the limit recommended by the CCME.

### 6.4.2 Management of Contaminated Soils

Table 6.3 below presents the environmental classification of soils compared to the generic criteria found in the “*Guide d’intervention*” (MDDELCC).

Table 6.3 Classification environnementale des sols

Sounding	Sample	Depth (m)	Analyzed Parameters				
			C <sub>10</sub> - C <sub>50</sub>	PAHs	Metals	VOCs	Phenols
F-01	CFE-3	1,22-1,75	<A	<A	A-B	<A	<A
	CFE-8	3,60-4,27	<A	--	A-B	--	--
F-02	CFE-2	0,61-1,22	A-B	A-B	A-B	--	--
	CFE-5	2,44-3,05	<A	--	<A	--	--
	CFE-8	4,27-4,88	<A	--	>C*	--	--
F-03	CFE-1	0,00-0,33	<A	<A	B-C	--	--
	CFE-3	1,52-2,13	<A	--	A-B	--	--
	CFE-4	2,28-2,89	<A	--	<A	--	--
F-05	CFE-1	0,00-0,61	<A	<A	<A	--	--
	CFE-3	1,22-1,83	<A	<A	A-B	<A	<A
F-06	CFE-1	0,00-0,13	<A	--	<A	--	--
F-07	CFE-1	0,00-0,61	<A	<A	A-B	--	--
	CFE-3	1,52-2,13	<A	--	<A	--	--
	CFE-7	3,81-4,42	<A	--	A	--	--
	CFE-8	4,57-4,90	<A	--	<A	--	--



Sounding	Sample	Depth (m)	Analyzed Parameters				
			C <sub>10</sub> - C <sub>50</sub>	PAHs	Metals	VOCs	Phenols
TR-01	VRE-1	0,18-1,00	<A	A-B	A	<A	<A
TR-02	VRE-1	0,05-0,80	<A	A-B	A-B	<A	<A
TR-03	VRE-1	0,05-1,50	<A	A	A-B	--	--
TR-04	VRE-1	0,00-0,15	<A	<A	<A	<A	<A
TR-05	VRE-3	1,0-1,80	<A	--	B-C	--	--

--- : not analyzed

\* : exceeding the « RESC » limit values

(1) : The generic criteria « A » corresponds to the background levels found in the St. Lawrence lowlands region

The results of the chemical analysis of soils present metal concentrations that exceed the CCME recommended limit for a Parkland site at the following locations:

- F-01 CFE-8, located in the Island Field – Riverside.
- F-02 CFE-8, located in the Island Field – Riverside.
- F-03 CFE-4, located in Downstream Jetty – Islandside.
- TR-02 VRE-1, located in the Downstream Jetty – Islandside.
- TR-05 VRE-3, located in the Downstream Jetty – Islandside.

If these soils were to be disposed of off-Site, they would need to be managed with respect to their environmental classification with respect to the generic criteria found in the *Guide d'intervention du MDDELCC* and to the RESC. As per the results of the chemical analyses:

- A-B soils (Metals: Nickel and Chrome) at the location of F-01 CFE-8;
- >C soils (Metals: Cobalt, Copper, Tin, Molybdenum, Nickel and Zinc) at the location of borehole F-02 CFE-8. These soils also surpass the RESC limit;
- <A soils (Metals: Chrome and Tin) at the location of borehole F-03 CFE-4;
- A-B soils (Metals: Copper) at the location of test pit TR-02 VRE-1;
- B-C soils (Metals: Tin) at the location of test pit TR-05 VRE-3.

The above mentioned contaminated soils would not be considered acceptable from an environmental standpoint for the current site use, according to the recommendations given by the CCME.

## 6.5 Quality Control

The quality control is based on the acceptable criteria from the *Centre d'expertise en analyse environnementale du Québec* (CEAEQ) that recommends a verification of the difference between result A and result B as per the following equation:

$$\text{Variance (\%)} = \frac{\text{Difference } A - B}{\text{Arithmetic Mean}} \times 100$$



As per the recommendations of the CEAEQ, the acceptable difference between a duplicate and an original sample are a function of the parameters analyzed as follows:

- **C<sub>10</sub> - C<sub>50</sub>** : the concentration of the duplicates must not exceed a 30% difference if the concentration is greater than 10 times the detection limit.
- **PAH** : the concentration of the duplicates must not exceed a 30% difference for 70% of the components once the concentration is greater than 10 times the detection limit.
- **Metals**: the concentration of the duplicates must not exceed a 30% difference if the concentration is greater than 10 times the detection limit.
- **MAH** : the duplicates must not exceed a 35% difference for 80% of the components.

In total, two (2) soil samples and their respective duplicates were analyzed for the same parameters in order to allow comparative analysis.

Although the majority of the parameters compared met the general recommendations of the CEAEQ, both duplicates revealed variances greater than the recommendations for certain metals. The concentration of Nickel and Zinc for the first pair of samples (F-01 CFE-3 and DUP-1) and Barium and Manganese for the second pair of samples (F-07 CFE-1 and DUP-2).

However, given the heterogeneous nature of fill, and the relatively low concentrations obtained, the calculated variances are considered acceptable for this study.

The variances of measured concentrations between samples does not cast doubt on the environmental classification of the soils as per the generic criteria, except for the manganese concentrations obtained in samples F-07 CFE-1 and DUP-2. The concentrations obtained were 870 mg/kg and 370 mg/kg. As a precaution, the 870 mg/kg concentration was used in order to interpret the environmental classification of soils using a worst-case approach, rendering the classification "A-B".

A table summarizing these results is presented in Appendix C.

In addition to Maxxam's internal quality control procedures, GHD performed the following verifications in order to ensure validity of the Maxxam results.

- It was initially ensured that the analytical methods to be used by Maxxam were all recognized and recommended by the MDDELCC;
- The numbered samples submitted and related depths corresponded to our request;
- The analyzed parameters were those requested;
- The analytical results obtained for internal duplicate issued by the laboratory correspond to their original counterparts; and
- The detection limits are compatible with the mandate's objective.

No anomalies were detected over the course of the above mentioned verifications. The chemical analysis results for the soils are considered to be valid with respect to the requirements of this study.



## 7. Estimated Volumes

Table 7.1 below presents the estimated volumes of soils that exceed recommendations of the CCME for the site usage (Parkland). In the case of an environmental rehabilitation of soils by excavation, the estimate of volumes classified by generic criteria is:

Table 7.1 Estimated volumes of contaminated soils classified by generic criteria (MDDELCC) for off-site management

Sounding	Surface Area (m <sup>2</sup> )	Depth Interval (m)	Exceeds CCME recommendations	Volume (m <sup>3</sup> )			
				<A	A-B	B-C	RESC
F-01	161	2,87 – 6,23	YES	---	541	---	---
F-02	611	4,12 – 6,63	YES	---	---	---	1534
F-03	1002	2,20 – 3,26	YES	1062	---	---	---
TR-02	521	0,05 – 1,50	YES	---	755	---	---
TR-05	109	0,05 – 1,80	YES	---	---	191	---
<b>Total estimated volumes (m<sup>3</sup>)</b>				<b>1062</b>	<b>1296</b>	<b>191</b>	<b>1534</b>

--- : Not applicable

The estimated volumes presented in the above table were evaluated using the following methodology:

- The influential surface area of a sounding extends to the mid-distance of the adjacent sounding, until the Site limit.
- The depth interval considered corresponds to the depth interval of the analyzed sample, given the total thickness of the fill or considering the site stratigraphy at the location of the sounding.

The polygon method is generally used for the evaluation of volumes of contaminated soils. It is important to note that the evaluated quantities can differ from the actual quantities measured during excavation work given:

- The quantities evaluated and presented in this report are based on information currently available.
- The contamination concentration of soils were determined using results of chemical analyses on a limited number of samples.
- The distribution of the contamination can be influenced by the presence of underground infrastructure, creating preferential pathways.
- Given the often punctual and heterogeneous nature of the phenomena of environmental contamination, the nature and degree of contamination between points of sampling can vary depending on conditions observed at the location of each sounding.



## 8. Conclusions

The professional services of GHD were retained by the firm Tetra Tech, represented by Mr. Jonathan Renaud, Eng., to conduct an environmental characterization of soils within the scope of the partial reconstruction project located at the Saint-Anne-de-Bellevue Canal, in Saint-Anne-de-Bellevue, Quebec. Over the course of the study, six (6) boreholes and six (6) test pits were advanced. Soil samples were collected, and a selection of these was submitted for chemical analysis.

The purpose of the environmental characterization of soils, undertaken by GHD, was to assess the environmental quality of the soils located in the “Downstream Jetty – Islandside” and the “Island Field – Riverside” sectors of the Site. It is important to note that the Site is located on Federal property.

### 8.1 Environmental Classification of Soils (CCME)

Based on the results obtained, soils coming from soundings F-01 CFE-8, F-02 CFE-8, F-03 CFE-4, TR-02 VRE-1 and TR-05 VRE-3 surpass the recommended limits given by the CCME for metals, as shown in Table 6.2 below. These soils are therefore not suitable for the current site usage.

The soil sample results were also compared to the generic criterion presented in the *Grille des critères génériques pour les sols* (Grille) du *Guide d'intervention – Protection de sols et réhabilitation des terrains contaminés* (Guide d'intervention) from the MDDELCC.

Based on the analytical data obtained from chemical analyses, the concentration of metals were greater than the CCME recommendations at the following sample locations:

- A-B soils (Metals: Nickel and Chrome) at the location of F-01 CFE-8;
- >C soils (Metals: Cobalt, Copper, Tin, Molybdenum, Nickel and Zinc) at the location of borehole F-02 CFE-8. These soils also surpass the RESC limit;
- <A soils (Metals: Chrome and Tin) at the location of borehole F-03 CFE-4;
- A-B soils (Metals: Copper) at the location of test pit TR-02 VRE-1;
- B-C soils (Metals: Tin) at the location of test pit TR-05 VRE-3.

The above mentioned contaminated soils would not be considered acceptable from an environmental standpoint for the current site use (Parkland), according to the recommendations given by the CCME.

It is important to note that generic criterion “A” is considered to be the threshold value above which restrictions could be applied to off Site disposal in the event that soils are excavated. It should be noted that if soils are excavated, soils classified within the “A-B” “B-C” or “RESC” range will have to be managed in accordance with the guidelines in the *Grille intérimaire de gestion des sols contaminés excavés* published by the MDDELCC (see Appendix D).



## 8.2 Environmental Rehabilitation

In the eventual possibility of an environmental rehabilitation of soils by excavation, an estimated total of 1062 m<sup>3</sup> of "<A", 1296 m<sup>3</sup> of "A-B", 191 m<sup>3</sup> of "B-C" and 1534 m<sup>3</sup> of "RESC" classified soils should be excavated and disposed of off-site at a location authorized to receive them.

The quantities presented in the present report are based on information currently available and could differ from the quantity of soils actually measured during the excavation work.

## 9. Limitation of the Investigation

The findings and conclusions of the Phase I Environmental Site Assessment are founded on the accuracy and reliability of the information obtained from all parties, unless contradicted by visual Site observations or written documentation.

The conclusions are presented based upon the readily available public information within the time frame of this mandate by trained professionals, following a prescribed and recognized assessment procedure.

This report is not intended to address, or provide comment on the presence, or absence of organic growth organisms commonly referred to as mould, through statements, inferences or omissions.

The report is prepared for the use of the Client and his named representatives in making an informed financial and business decision regarding environmental liabilities that may be associated with the Site. The use of this report for any other purpose is at the Client's own risk.

The Client must understand that changing circumstances in the physical or regulatory environment, the administration and use of the Site, as well as changes in any substances stored, used, or disposed of at the Site, could significantly alter the conclusions and information contained in this report. Therefore, it is important that the Client periodically re-evaluates the Site and reviews developments or operations, which may potentially impact the Site.

All of Which is Respectfully Submitted,

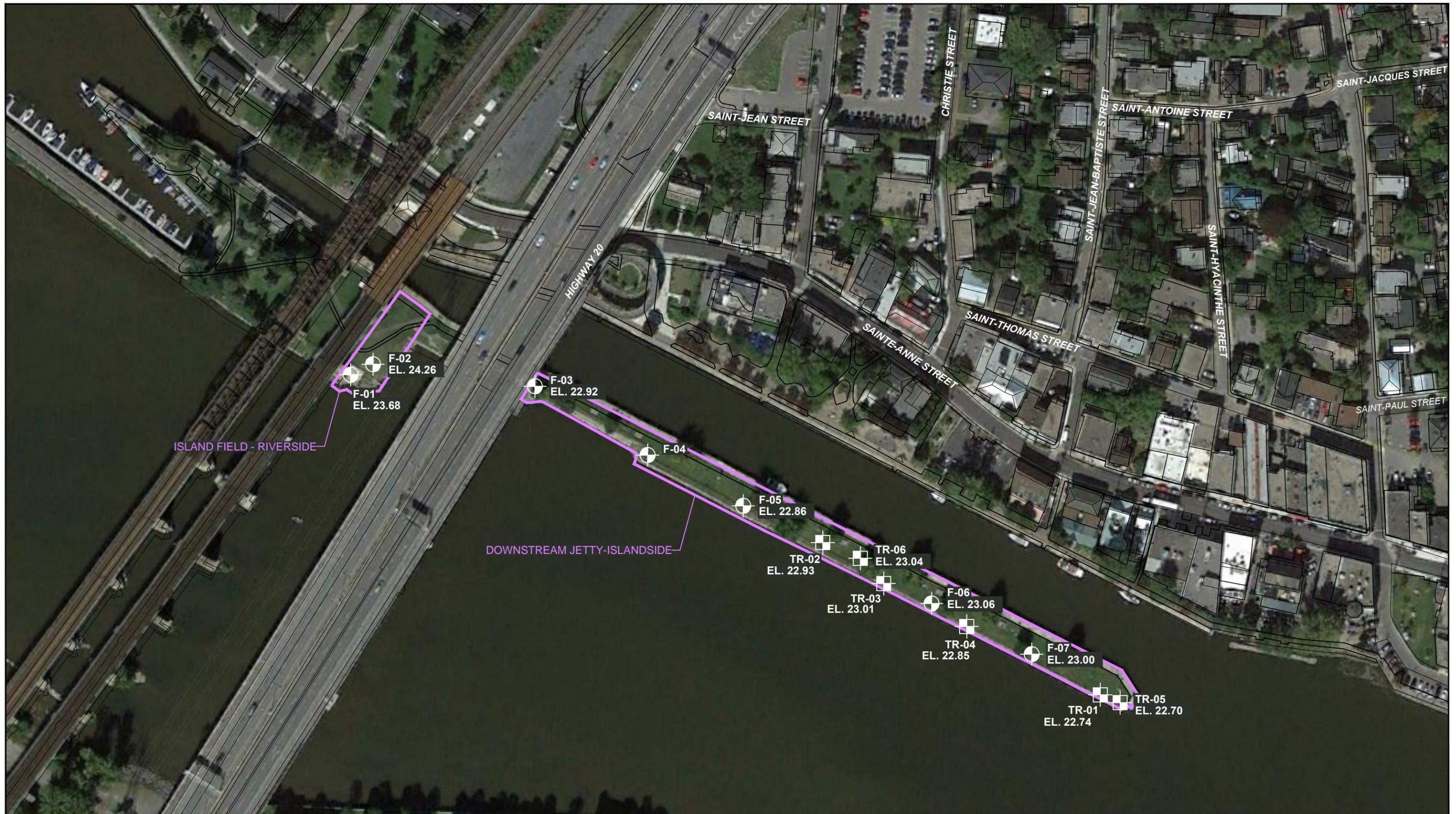
GHD

Ruben Sabogal, B.Sc.A., M.Sc.A.

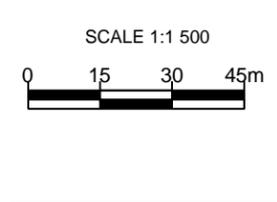
Frederic Belanger, Geogr., D.E.I.A., M. Eng.

# Appendix

Appendix A  
Site and Sounding Location Plan (11131157-E1-1)  
Interpretation of Contamination (11131157-E1-2)



Source: Données cartographiques © 2015 Google ou Image © 2015 Google, DigitalGlobe.



**LEGEND**

	<b>F-01</b> EL. 23.68	BOREHOLE, NUMBER AND GROUND SURFACE ELEVATION (m)
	<b>TR-01</b> EL. 22.90	TEST PIT, NUMBER AND GROUND SURFACE ELEVATION (m)

NOTE: BOREHOLE No. F-04 WAS CANCELLED

DRAWN BY:  
J. SANTOS

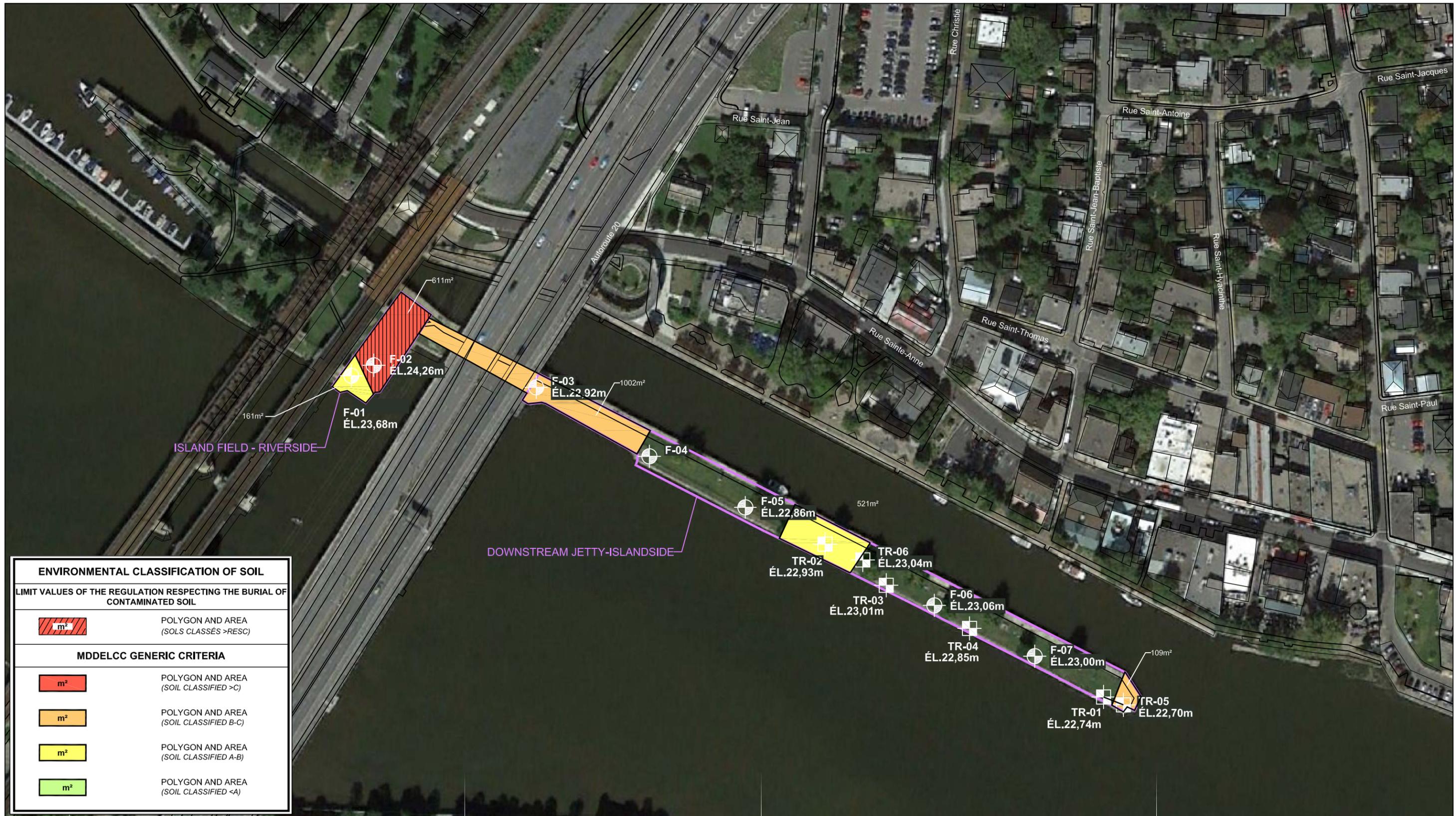
VERIFIED BY:  
V. JOLIN T.



TETRA TECH  
 SAINTE-ANNE-DE-BELLEVUE, QUEBEC  
 RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL

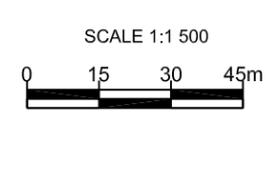
BOREHOLE AND TEST PIT LOCATIONS

11131157-A1  
 Jun 12, 2017



ENVIRONMENTAL CLASSIFICATION OF SOIL	
LIMIT VALUES OF THE REGULATION RESPECTING THE BURIAL OF CONTAMINATED SOIL	
	POLYGON AND AREA (SOLS CLASSÉS >RESC)
MDELCC GENERIC CRITERIA	
	POLYGON AND AREA (SOIL CLASSIFIED >C)
	POLYGON AND AREA (SOIL CLASSIFIED B-C)
	POLYGON AND AREA (SOIL CLASSIFIED A-B)
	POLYGON AND AREA (SOIL CLASSIFIED <A)

Source: Map data © 2015 Google or Image © 2015 Google, DigitalGlobe.



LEGEND	
	<b>F-01</b> ÉL.23,68m BOREHOLE, NUMBER AND GROUND SURFACE ELEVATION (m)
	<b>TR-01</b> ÉL.22,90m TEST PIT, NUMBER AND GROUND SURFACE ELEVATION (m)
NOTE: BOREHOLE No. F-04 WAS CANCELLED	

DRAWN BY:	J. SANTOS
VERIFIED BY:	J.KADI



TETRA TECH  
 SAINTE-ANNE-DE-BELLEVUE, QUEBEC  
 RECONSTRUCTION OF THE RETAINING WALL DOWNSTREAM OF THE SAINTE-ANNE-DE-BELLEVUE CANAL  
 LOCATION PLAN AND INTERPRETED CONTAMINATION OF SOILS

11131157-E1  
 Sep 29, 2017

# Appendix B

## Borehole and Test Pit Reports



# BOREHOLE REPORT

Borehole No.

F-01

CLIENT: TETRA TECH	PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL	LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC	DESCRIBED BY: F. ARGUIN	VERIFIED BY: V. JOLIN T.	GEODETIC COORDINATES (MTM, NAD-83) (m) X : 269111.0 Y : 5029430.4 Z : 23.68	- WATER LEVEL Date : Depth (m) : Location plan : 11131157-A1-1
--------------------	---	---	-------------------------	--------------------------	--	---

Borehole type : Casing Core bit size : B, N, NQ Hammer type : Automatic Energy ratio : Date (start) : 2017-03-08 Date (finish) : 2017-03-09	SS(E) - Split Spoon (Environment) RC(E) - Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample	SAMPLE STATE <input checked="" type="checkbox"/> Remoulded <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Diamond drilling <input type="checkbox"/> Lost	TEST SYMBOL GSA: grain size analysis CA: chemical analysis W <sub>L</sub> : liquid limit W <sub>p</sub> : plastic limit w: water content C <sub>u</sub> : undrained shear strength S <sub>r</sub> : sensitivity Dup: duplicate sample
--	---	---	---

STRATIGRAPHY				SAMPLE					TESTS RESULTS												
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)    △ C <sub>u</sub> (Field, kPa) □ Atterberg limits (%)    □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value										
0.00	23.68		Ground surface								10	20	30	40	50	60	70	80	90	Water level	
			Concrete slab (880mm)		CR-1	99															
1.0	0.88	22.80	Fill: Loose to compact, brown sand, some gravel, traces of silt, moist		CF-2 CFE-2 CFE-3	94 34	CA		8-5 (B) 6-1-6-50/8cm (B)	13 7											
2.0	1.75	21.93	Grey-pink sandstone gravel		CR-4	29															
3.0	2.87	20.81	Presence of debris (mortar, concrete fragments, steel)		CF-5 CR-6	50 100			50/8cm (B)	R 0											
	3.29	20.39	Grey-beige sandstone gravel		CR-7	61															
4.0	3.60	20.08	Compact, silt, some clay, traces of gravel and sand, saturated		CF-8 CFE-8	45	CA		37-6-4-3 (B)	10											
	4.27	19.41	becoming with presence of debris (wood)		CF-9	26			8-8-8-7 (B)	16											
5.0					CF-10	85			14-10-9-7 (N)	12*											
6.0	5.51	18.17	Very loose, grey silt, some clay, traces of sand and gravel, saturated. Presence of debris (wood)		CF-11	7			5-1-2-2 (N)	2*											
	6.23	17.45	<b>Bedrock:</b> Pink sandstone, poor rock quality		CF-12	62			50/13cm (N)	R											
7.0					CR-13	74	Co = 278.9 MPa			50											
8.0	7.42	16.26	End of borehole																		
9.0			Note: * "N" penetration value adjusted according to the size of the split spoon used																		

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-02**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269120.4                  Y : 5029434.8                  Z : 24.26</p>	<p>▼ - WATER LEVEL                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
<p>Borehole type : Auger + Casing                  Core bit size : B, N, NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-08                  Date (finish) : 2017-02-13</p>	<p><b>SAMPLE TYPE</b></p> <p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<p><b>SAMPLE STATE</b></p> <p>☒ Remoulded                  ☒ Intact                  ◻ Diamond drilling                  ◼ Lost</p>
<p><b>TEST SYMBOL</b></p> <p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>		

STRATIGRAPHY				SAMPLE				TESTS RESULTS								
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)    △ C <sub>u</sub> (Field, kPa) ▭ Atterberg limits (%)    □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value					
0.00	24.26		Ground surface													
0.29	23.97		<b>Fill:</b> Very dense, brown sand, traces of silt and gravel, moist. Presence of frozen topsoil		CF-1A CFE-1A	79			6-36-49-44	85						
0.83	23.43		Dense, grey crushed stone of 20-0mm apparent size, moist Compact, brown gravel and sand, some silt, moist. Presence of debris (mortar)		CF-1B CF-2A CFE-2A CF-2B CFE-2B	66	CA		8-24-11-10	35						
1.83	22.43		becoming loose		CFE-3	46	GSA w		5-4-7-5	11						
2.38	21.88		becoming saturated		CF-4 CFE-4	43			3-3-3-3	6						
3.05	21.21		becoming compact		CF-5 CFE-5	39			2-2-4-1	6						
4.12	20.14		Loose, grey silt, some gravel, traces of sand, saturated		CF-6 CFE-6	46			12-20-7-3	27						
4.88	19.38		becoming very loose with traces of clay		CF-7 CFE-7	10			8-8-5-6	13						
5.49	18.77		becoming very loose with some clay		CF-8 CFE-8	38	CA		4-6-6-10	8*						
6.10	18.16		becoming dense with presence of debris (wood)		CF-9 CFE-9	38			2-2-4-3	4*						
6.63	17.63		<b>Probable bedrock</b>		CFE-10	44			3-2-2-5	3*						
6.78	17.48		End of borehole		CF-11 CFE-11 CF-12	56 0			6-38-23-44	40*						
			Note: * "N" penetration value adjusted according to the size of the split spoon used						50/7cm	R						

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-03**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269188.2                  Y : 5029425.6                  Z : 22.92</p>	<p>▼ - WATER LEVEL                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
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<p>Borehole type : Casing                  Core bit size : B+NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-13                  Date (finish) : 2017-03-13</p>	<b>SAMPLE TYPE</b>	<p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<b>SAMPLE STATE</b>	<p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input checked="" type="checkbox"/> Lost</p>	<b>TEST SYMBOL</b>	<p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>
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STRATIGRAPHY				SAMPLE					TESTS RESULTS											
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      △ C <sub>u</sub> (Field, kPa) W <sub>p</sub> , W <sub>L</sub> Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value									
0.00	22.92		Ground surface								10 20 30 40 50 60 70 80 90 <b>Water level</b>									
0.10	22.82	[Cross-hatch symbol]	Frozen, brown topsoil, moist	X	CF-1	100	CA		10-49-50/3cm	R										
0.33	22.59		Fill: Frozen, brown sand, traces of silt, moist	X	CFE-1															
1.0			Concrete slab (710mm)																	
1.04	21.88	[Cross-hatch symbol]	Loose, brown sand, some gravel, traces of silt, saturated	X	CF-2	0			50/4cm	R										
2.0					X	CF-3 CFE-3	16	CA		4-3-2-2	5									
2.20	20.72	[Cross-hatch symbol]	Very loose, grey silt, some clay, traces of sand and gravel, saturated	X	CF-4	79	GSA w		1-1-2-1	3										
3.0					X	CF-5 CFE-5	38			13-50/6cm	R									
3.26	19.66	[Dotted symbol]	<b>Bedrock:</b> Grey sandstone, good rock quality	█																
4.0					█	CR-6	96	Co = 309.4 MPa			89									
4.54	18.38		End of borehole																	
5.0																				
6.0																				
7.0																				
8.0																				
9.0																				

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-05**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269275.6                  Y : 5029375.6                  Z : 22.86</p>	<p>▼ - WATER LEVEL                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
<p>Borehole type : Casing                  Core bit size : B, N, NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-09                  Date (finish) : 2017-03-09</p>	<p><b>SAMPLE TYPE</b></p> <p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<p><b>SAMPLE STATE</b></p> <p>☒ Remoulded                  ▨ Intact                  ◻ Diamond drilling                  ◼ Lost</p>
<p><b>TEST SYMBOL</b></p> <p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>P</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>		

STRATIGRAPHY				SAMPLE				TESTS RESULTS				
Depth (m)	Elevation (m)	Symbol	Description	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	Water level		
0.00	22.86		Ground surface									
0.07	22.79		Frozen, brown topsoil, moist	CF-1A		CA						
0.33	22.53		<b>Fill:</b> Frozen, brown silty sand, traces of gravel, moist	CFE-1A CFE-1B CFE-1C	75			8-40-45-20 (B)	85			
0.79	22.07		Very dense, brown sandstone cobbles, traces of sand, moist	CFE-1C CF-2	13	GSA w		10-6-12-12 (B)	18			
1.22	21.64		Compact, brown sandy gravel, traces of silt, saturated becoming dense	CF-3 CFE-3	54	CA		9-22-19-21 (B)	41			
1.83	21.03		becoming compact	CF-4	21			19-12-9-9 (N)	14*			
2.44	20.42		becoming loose	CF-5	13			8-9-4-3 (N)	8*			
2.79	20.07		Dense, grey sandy gravel, some silt, saturated	CF-6	41	GSA w		5-19-20-10 (B)	39			
3.66	19.20		becoming compact with presence of debris (wood)	CF-7	10			8-4-6-7 (B)	10			
4.88	17.98		becoming loose to compact	CF-8 CF-9	36 25			16-11-14-8 (N) 11-5-7-9 (N)	16* 8*			
6.10	16.76		Compact, grey gravellt silt, saturated. Presence of debris (wood)	CF-10 CR-11	21 60			8-9-6-4 (N)	10*			
6.65	16.21		<b>Bedrock:</b> Beige-grey sandstone, poor rock quality	CR-12	100	Co = 72.7 MPa			36			
8.33	14.53		End of borehole	CR-13	100				23			
9.0			Note: * "N" penetration value adjusted according to the size of the split spoon used									

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-06**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES (MTM, NAD-83) (m)</b>                  X : 269354.5                  Y : 5029334.8                  Z : 23.06</p>	<p><b>▼ - WATER LEVEL</b>  <b>Date :</b>  <b>Depth (m) :</b></p> <p><b>Location plan :</b> 11131157-A1-1</p>
<p><b>Borehole type :</b> Casing  <b>Core bit size :</b> B, N, NQ  <b>Hammer type :</b> Automatic  <b>Energy ratio :</b>  <b>Date (start) :</b> 2017-03-10  <b>Date (finish) :</b> 2017-03-13</p>	<p><b>SAMPLE TYPE</b></p> <p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<p><b>SAMPLE STATE</b></p> <p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input checked="" type="checkbox"/> Lost</p>
<p><b>TEST SYMBOL</b></p> <p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>		

STRATIGRAPHY				SAMPLE				TESTS RESULTS						
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      Δ C <sub>u</sub> (Field, kPa) □ Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value			
0.00	23.06		Ground surface								10 20 30 40 50 60 70 80 90 <b>Water level</b>			
0.06	23.00		Frozen, brown topsoil, moist		CFE-1	100	CA		50/13cm (B)	R				
			<b>Fill:</b> Compact, brown gravel, some sand, traces of silt, moist											
1.0					CF-2	23			28-12-5-7 (N)	11*				
1.20	21.86		becoming saturated		CFE-2									
2.0					CF-3	20	GSA w		13-12-8-20 (N)	13*				
2.28	20.78		becoming loose with presence of debris (wood)		CF-4	7			3-3-9-8 (N)	8*				
3.0	20.16		Piece of wood		CF-5	79			6-34-28-22 (N)	41*				
3.58	19.48		Presence of cobbles											
3.69	19.37		Very dense, brown sand, some gravel, traces of silt, saturated		CF-6	31			50/13cm (N)	R				
4.19	18.87		Beige sandstone blocks		CR-7	59				0				
4.43	18.63		Brown gravelly sand, traces of silt, saturated		CF-8	80			50/10cm	R				
4.67	18.39		<b>Bedrock:</b> Beige sandstone, poor rock quality											
5.35	17.71		Grey clayey limestone		CR-9	79				36				
5.51	17.55		Beige sandstone, poor rock quality											
6.19	16.87		End of borehole											
			Note: * "N" penetration value adjusted according to the size of the split spoon used											

See the attached explicative note for the complete list of symbols and abbreviations



# BOREHOLE REPORT

**Borehole No.**

**F-07**

<p><b>CLIENT:</b> TETRA TECH  <b>PROJECT:</b> RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL  <b>LOCATION:</b> SAINTE-ANNE-DE-BELLEVUE, QUEBEC  <b>DESCRIBED BY:</b> F. ARGUIN      <b>VERIFIED BY:</b> V. JOLIN T.</p>	<p><b>GEODETTIC COORDINATES</b>                  (MTM, NAD-83) (m)                  X : 269396.4                  Y : 5029313.6                  Z : 23.00</p>	<p><b>▼ - WATER LEVEL</b>                  Date :                  Depth (m) :                  Location plan : 11131157-A1-1</p>
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<p>Borehole type : Casing                  Core bit size : B, N, NQ                  Hammer type : Automatic                  Energy ratio :                  Date (start) : 2017-03-10                  Date (finish) : 2017-03-10</p>	<b>SAMPLE TYPE</b>	<p>SS(E) - Split Spoon (Environment)                  RC(E) - Rock diamond core                  AU(E) - Auger                  TEE - Sampling Tube Environment                  ST - Shelby tube                  GS(E) - Grab sample</p>	<b>SAMPLE STATE</b>	<p><input checked="" type="checkbox"/> Remoulded  <input checked="" type="checkbox"/> Intact  <input type="checkbox"/> Diamond drilling  <input checked="" type="checkbox"/> Lost</p>	<b>TEST SYMBOL</b>	<p>GSA: grain size analysis                  CA: chemical analysis                  W<sub>L</sub>: liquid limit                  W<sub>p</sub>: plastic limit                  w: water content                  C<sub>u</sub>: undrained shear strength                  S<sub>r</sub>: sensitivity                  Dup: duplicate sample</p>
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STRATIGRAPHY				SAMPLE					TESTS RESULTS					
Depth (m)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	○ Water content (%)      Δ C <sub>u</sub> (Field, kPa) □ Atterberg limits (%)      □ C <sub>u</sub> (Lab, kPa) ● "N" Standard penetration test value ▲ "N <sub>c</sub> " Dynamic penetration test value			
0.00	23.00		Ground surface								10 20 30 40 50 60 70 80 90 <b>Water level</b>			
0.08	22.92		Frozen, brown topsoil, moist	X	CF-1	66	CA		8-34-30-25 (B)	64				
1.0			Fill: Compact to dense, brown silty sand, some gravel, moist. Presence of cobbles	X	CFE-1									
1.20	21.80		becoming saturated	X	CF-2	21			10-14-9-3 (B)	23				
1.44	21.56		becoming dense, gravelly with traces of silt	X	CF-3	36	CA		22-24-35-21 (N)	39*				
2.28	20.72		becoming compact	X	CFE-3									
3.0				I	CF-4	10			12-13-7-9 (N)	13*				
3.81	19.19		Compact, brown to grey sandy gravel, traces of silt, saturated	X	CR-5 CF-6	44 0			0/18cm 50/15cm (B)	R				
4.57	18.43		becoming with some gravel	X	CF-7	59	CA GSA w		34-15-28-16 (N)	28*				
5.10	17.90		Grey clayey limestone blocks	I	CF-8	85	CA		8-16-50/3cm (N)	R				
6.06	16.94		<b>Probable bedrock</b>	I	CR-9	31								
6.10	16.90		End of borehole	I										
7.0			Note: * "N" penetration value adjusted according to the size of the split spoon used											

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-01**

CLIENT: TETRA TECH	GEODETIC COORDINATES (m) (MTM, NAD-83) X : 269425.2 Y : 5029296.6 Z : 22.74	← - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type		Manual tests
DATE: 2017-03-09	CA : Chemical analysis	PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon	AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core	GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> ) GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	22.74					
0.05	22.69		<b>Topsoil</b> <b>Fill:</b> Frozen, brown sandy silt			
0.18	22.56		Crushed stone of 20-0mm apparent size, some sandy silt. <1% of debris (wood, glass)			
0.5	0.48	22.26	 Gravelly sand and silt 5-10% of cobbles and boulders	VR-1 VRE-1	CA	
1.0				VR-2	w = 15.0% GSA	←
1.20	21.54		End of test pit  Note: Strong water infiltration at 1.15m depth			
1.5						
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-02**

CLIENT: TETRA TECH	GEODETIC COORDINATES (m) (MTM, NAD-83) X : 269308.9 Y : 5029360.3 Z : 22.93	- INFILTRATION - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type		Manual tests
DATE: 2017-03-09	CA : Chemical analysis	PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon	AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core	GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> )
			GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	
					Type	
0,0	22.93					
0.05	22.88		<b>Topsoil</b> <b>Fill:</b> Brown sandy and gravelly silt 15-20% of cobbles and boulders	VR-1 VRE-1	CA	
0.5						
1.0				VR-2 VRE-2		
1.5	21.43		End of test pit  Note: Strong water infiltration at 1.20m depth			
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-03**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269334.4 Y : 5029343.1 Z : 23.01	← - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type	Manual tests
DATE: 2017-03-08	CA : Chemical analysis PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> ) GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	23.01					
0.05	22.96		<b>Topsoil</b> <b>Fill:</b> Brown silty sand, some gravel. <1% of debris (glass, metal)			
0.30	22.71		becoming with 35-40% of cobbles and boulders			
0.5						
1.0				VR-1	w = 14.0% GSA CA	
1.5	21.51		End of test pit  Note: Strong water infiltration at 1.35m depth			←
2.0						
2.5						



**TEST PIT REPORT**

**TEST PIT No.**

**TR-04**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269369.2 Y : 5029325.2 Z : 22.85	< - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type		Manual tests
DATE: 2017-03-08	CA : Chemical analysis	PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon	AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core	GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> )
			GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	
					Type	▼
0,0	22.85					<
0.05	22.80		<b>Topsoil</b>	VR-1		
0.15	22.70		<b>Fill:</b> Frozen, brown sandy silt. <1% of debris (glass, metal) Brown sandy and gravelly silt 35-40% of cobbles and boulders	VR-1 VRE-1		
0.5				VR-2	w = 13.0% GSA CA	
1.0						
1.5	21.35		End of test pit  Note: Strong water infiltration at 1.30m depth			<
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-05**

CLIENT: TETRA TECH	GEODETTIC COORDINATES (m) (MTM, NAD-83) X : 269433.5 Y : 5029293.3 Z : 22.70	← - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type	Manual tests
DATE: 2017-03-08	CA : Chemical analysis PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> ) GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	22.70					
0.05	22.65		<b>Topsoil</b> <b>Fill:</b> Frozen, brown sandy silt	VR-1 VRE-1		
0.25	22.45		Crushed stone of 20-0mm apparent size  - Presence of block (Ø 30 to 50cm) at 0.4m depth	VR-2	w = 9.0% GSA	
1.00	21.70		Brown-grey sandy silt, some gravel to gravelly 10-15% of cobbles and boulders	VR-3 VRE-3	CA	
1.80	20.90		End of test pit  Note: - Strong water infiltration at 1.65m depth - Presence of steel frame at 0.7m and 1.05m depth			
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations



**TEST PIT REPORT**

**TEST PIT No.**

**TR-06**

CLIENT: TETRA TECH	GEODETIC COORDINATES (m) (MTM, NAD-83) X : 269324.6 Y : 5029353.7 Z : 23.04	← - INFILTRATION ▼ - WATER LEVEL
PROJECT: RECONSTRUCTION OF THE SAINTE-ANNE-DE-BELLEVUE CHANNEL RETAINING WALL		
LOCATION: SAINTE-ANNE-DE-BELLEVUE, QUEBEC		

DESCRIBED BY: M. DUBUC	Sample type	Manual tests
DATE: 2017-03-09	CA : Chemical analysis PS : Proctor Sample	PA : Panda (q <sub>d</sub> )
VERIFIED BY: V. JOLIN T.	MSS: Manual split spoon AU: Auger	PP : Portable penetrometer (C <sub>u</sub> )
DATE: 2017-03-10	RC : Rock core GS(E) : Grab sample (environment)	DP: Dynamic penetrometer (E <sub>25</sub> ) GVT: Geonor Vane tester (C <sub>v</sub> )

Depth (m)	Elevation (m)	Symbol	STRATIGRAPHY	Sample type & Number	Tests	▼
					Type	
0,0	23.04					
0.05	22.99		<b>Topsoil</b> <b>Fill:</b> Brown gravelly and sandy silt. 5-10% of cobbles and boulders Presence of debris (wood, steel frame, electrical wire)			
1.20	21.84		End of test pit			
0.5						
1.0						
1.5						
2.0						
2.5						

See the attached explicative note for the complete list of symbols and abbreviations

# Appendix C

## CEAEQ Quality Control Table (in French)

**TABLEAU I**  
**RÉSUMÉ DES ANALYSES CHIMIQUES SUR LES SOLS**  
**CARACTÉRISATION ENVIRONNEMENTALE DES SOLS**  
**CANAL-DE SAINTE-ANNE-DE-BELLEVUE**  
**SAINTE-ANNE-DE-BELLEVUE, QC**

Sondage	F-01	F-01	F-02	F-02	F-02	F-03	F-03	F-03	F-05
Échantillon	F-01 CFE-3	F-01 CFE-8	F-02 CFE-2	F-02 CFE-5	F-02 CFE-8	F-03 CFE-1	F-03 CFE-3	F-03 CFE-4	F-05 CFE-1
Profondeur min (m ss)	1.22	3.60	0.61	2.44	4.27	0.00	1.52	2.28	0.00
Profondeur max (m ss)	1.75	4.27	1.22	3.05	4.88	0.33	2.13	2.89	0.61

Paramètre	MDDELCC			RESC	CCME (grains grossiers)	Unités								
	A	B	C				Annexe I <sup>12)</sup>	Rés/Parc						
<b>Métaux</b>														
Argent (Ag)	2	20	40	200	20	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	6	30	50	250	12	mg/kg	<5	<5	<5	<5	7	<5	<5	<5
Baryum (Ba)	340	500	2000	10000	500	mg/kg	89	180	130	27	36	190	97	180
Cadmium (Cd)	1.5	5	20	100	10	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrome (Cr)	100	250	800	4000	64	mg/kg	23	100	14	7	21	19	18	77
Cobalt (Co)	25	50	300	1500	50	mg/kg	5	20	5	3	540	4	6	19
Cuivre (Cu)	50	100	500	2500	63	mg/kg	13	46	19	5	8300	11	11	40
Étain (Sn)	5	50	300	1500	50	mg/kg	<4	<4	<4	<4	200	<4	<4	<4
Manganèse (Mn)	1000	1000	2200	11000	--	mg/kg	280	550	690	100	1400	1700	660	750
Molybdène (Mo)	2	10	40	200	10	mg/kg	2	<1	1	<1	76	2	<1	<1
Nickel (Ni)	50	100	500	2500	45	mg/kg	12	59	13	5	310	14	14	48
Plomb (Pb)	50	500	1000	5000	140	mg/kg	40	10	100	<5	6	18	53	10
Zinc (Zn)	140	500	1500	7500	200	mg/kg	110	88	120	10	5700	55	63	97
<b>HAP</b>														
Acénaphthène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	0.1	-	-	ND (0.1)	-	ND (0.1)
Acénaphthylène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
Anthracène	0.1	10	100	100	2.5	mg/kg	ND (0.1)	-	0.4	-	-	ND (0.1)	-	ND (0.1)
Benzo(a)anthracène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	0.5	-	-	ND (0.1)	-	ND (0.1)
Benzo(a)pyrène	0.1	1	10	34	20	mg/kg	ND (0.1)	-	0.4	-	-	ND (0.1)	-	ND (0.1)
Benzo(b)fluoranthène	0.1	1	10	136	--	mg/kg	ND (0.1)	-	0.4	-	-	ND (0.1)	-	ND (0.1)
Benzo(j)fluoranthène	0.1	1	10	136	--	mg/kg	ND (0.1)	-	0.2	-	-	ND (0.1)	-	ND (0.1)
Benzo(k)fluoranthène	0.1	1	10	136	--	mg/kg	ND (0.1)	-	0.2	-	-	ND (0.1)	-	ND (0.1)
Benzo(c)phénanthrène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
Benzo(ghi)peryène	0.1	1	10	18	--	mg/kg	ND (0.1)	-	0.3	-	-	ND (0.1)	-	ND (0.1)
Chrysène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	0.5	-	-	ND (0.1)	-	ND (0.1)
Dibenzo(a,h)anthracène	0.1	1	10	82	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
Dibenzo(a,i)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
Dibenzo(a,h)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
Dibenzo(a,l)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
7,12-Diméthylbenzanthracène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
Fluoranthène	0.1	10	100	100	50	mg/kg	ND (0.1)	-	1.5	-	-	ND (0.1)	-	ND (0.1)
Fluorène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	0.2	-	-	ND (0.1)	-	ND (0.1)
Indéno(1,2,3-cd)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	0.3	-	-	ND (0.1)	-	ND (0.1)
3-Méthylcholanthrène	0.1	1	10	150	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
Naphtalène	0.1	5	50	56	--	mg/kg	ND (0.1)	-	0.1	-	-	ND (0.1)	-	ND (0.1)
Phénanthrène	0.1	5	50	56	--	mg/kg	ND (0.1)	-	1.7	-	-	ND (0.1)	-	ND (0.1)
Pyrène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	1	-	-	ND (0.1)	-	ND (0.1)
2-Méthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
1-Méthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
1,3-Diméthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
2,3,5-Triméthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)
<b>Hydrocarbures Pétroliers</b>														
HP (C10-C50)	300	700	3500	10000	--	mg/kg	250	ND (100)	380	ND (100)	ND (100)	120	ND (100)	ND (100)

**Notes:**  
A, B, C : Critères génériques du Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés du MDDELCC  
1 Limites de l'annexe I du "Règlement sur l'enfouissement des sols contaminés" (RESC);  
2 En raison que la récupération ou l'écart relatif (RPD) pour le cuivre et le plomb étaient dehors des limites de contrôle pour l'échantillon TR-02 VRE-1 Dup. de Lab, une reprise de l'analyse a été effectuée. Le nouveau échantillon a été nommé TR-02 VRE-1 (RÉPÉTÉ)  
3 Le Dup Lab correspond à une analyse réalisée par le Laboratoire aux fins du contrôle de la qualité et de la vérification de la précision de la méthode réalisée tel qu'indiqué dans les Lignes directrices concernant les travaux analytiques en chimie du Centre d'expertise en analyse environnementale du Québec dans le cadre du Programme d'accréditation des laboratoires d'analyse (PALA)

  Dépassement du critère A du MDDELCC  
  Dépassement du critère B du MDDELCC  
  Dépassement du critère C du MDDELCC  
  Dépassement des limites fixés à l'annexe I du RESC  
ND (0.01) : Paramètre non détecté (limite de détection)  
-- : Aucun critère  
- : Non analysé

**TABLEAU I**  
**RÉSUMÉ DES ANALYSES CHIMIQUES SUR LES SOLS**  
**CARACTÉRISATION ENVIRONNEMENTALE DES SOLS**  
**CANAL-DE SAINTE-ANNE-DE-BELLEVUE**  
**SAINTE-ANNE-DE-BELLEVUE, QC**

Sondage	F-01	F-01	F-02	F-02	F-02	F-03	F-03	F-03	F-05
Échantillon	F-01 CFE-3	F-01 CFE-8	F-02 CFE-2	F-02 CFE-5	F-02 CFE-8	F-03 CFE-1	F-03 CFE-3	F-03 CFE-4	F-05 CFE-1
Profondeur min (m ss)	1.22	3.60	0.61	2.44	4.27	0.00	1.52	2.28	0.00
Profondeur max (m ss)	1.75	4.27	1.22	3.05	4.88	0.33	2.13	2.89	0.61

Paramètre	MDDELCC			RESC Annexe I <sup>(1)</sup>	CCME (grains grossiers) Rés/Parc	Unités													
	A	B	C																
<b>HAM</b>																			
Benzène	0.2	0.5	5	5	0.03	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzène	0.2	5	50	50	0.082	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Styrène	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Toluène	0.2	3	30	30	0.37	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Xylènes Totaux	0.4	5	50	50	11	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
<b>Hydrocarbures aliphatiques chlorés</b>																			
Chloroforme	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Chlorure de vinyle	0.4	0.4	0.4	60	--	mg/kg	ND (0.02)	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroéthylène	0.2	5	50	50	--	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroéthylène (cis+trans)	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorométhane	--	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichloropropène (cis+trans)	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tétrachloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Tétrachloroéthylène	0.2	5	50	50	0.2	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Tétrachlorure de carbone	0.1	5	50	50	5	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroéthane	0.2	5	50	50	--	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroéthylène	0.2	5	50	50	0.01	mg/kg	ND (0.2)	-	-	-	-	-	-	-	-	-	-	-	-
<b>Phénols</b>																			
o-Crésol	0.1	1	10	56	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
m-Crésol	0.1	1	10	56	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
p-Crésol	0.1	1	10	56	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Diméthylphénol	0.1	1	10	140	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitrophénol	0.5	1	10	130	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitrophénol	0.5	1	10	290	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
Phénol	0.1	1	10	62	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2-Chlorophénol	0.1	0.5	5	57	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
3-Chlorophénol	0.1	0.5	5	57	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorophénol	0.1	0.5	5	57	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,3-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,4 + 2,5-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,6-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
3,4-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
3,5-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophénol	0.1	0.5	5	74	7.6	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,3,4,5-Tétrachlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,3,4,6-Tétrachlorophénol	0.1	0.5	5	74	0.5	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,3,5,6-Tétrachlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,3,4-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,3,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,3,6-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophénol	0.1	0.5	5	74	0.5	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-
3,4,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-

**Notes:**  
A, B, C : Critères génériques du Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés du MDDELCC  
1 Limites de l'annexe I du "Règlement sur l'enfouissement des sols contaminés" (RESC);  
2 En raison que la récupération ou l'écart relatif (RPD) pour le cuivre et le plomb étaient dehors des limites de contrôle pour l'échantillon TR-02 VRE-1 Dup. de Lab, une reprise de l'analyse a été effectuée. Le nouveau échantillon a été nommé TR-02 VRE-1 (RÉPÉTÉ)  
3 Le Dup Lab correspond à une analyse réalisée par le Laboratoire aux fins du contrôle de la qualité et de la vérification de la précision de la méthode réalisée tel qu'indiqué dans les Lignes directrices concernant les travaux analytiques en chimie du Centre d'expertise en analyse environnementale du Québec dans le cadre du Programme d'accréditation des laboratoires d'analyse (PALA)  
Dépassement du critère A du MDDELCC  
Dépassement du critère B du MDDELCC  
Dépassement du critère C du MDDELCC  
Dépassement des limites fixés à l'annexe I du RESC  
ND (0.01) : Paramètre non détecté (limite de détection)  
-- : Aucun critère  
- : Non analysé

**TABLEAU I**  
**RÉSUMÉ DES ANALYSES CHIMIQUES SUR LES SOLS**  
**CARACTÉRISATION ENVIRONNEMENTALE DES SOLS**  
**CANAL-DE SAINTE-ANNE-DE-BELLEVUE**  
**SAINTE-ANNE-DE-BELLEVUE, QC**

Sondage	F-05	F-06	F-07	F-07	F-07	F-07	TR-01	TR-02	TR-02
Échantillon	F-05 CFE-3	F-06 CFE-1	F-07 CFE-1	F-07 CFE-3	F-07 CFE-7	F-07 CFE-8	TR-01 VRE-1	TR-02 VRE-1	TR-02 VRE-1 RÉPÉTÉ (2)
Profondeur min (m ss)	1.22	0.00	0.00	1.52	3.81	4.57	0.18	0.05	0.05
Profondeur max (m ss)	1.83	0.13	0.61	2.13	4.42	4.90	1.00	0.80	0.80

Paramètre	MDDELCC			RESC	CCME (grains grossiers) Rés/Parc	Unités								
	A	B	C				Annexe I <sup>1)</sup>							
<b>Métaux</b>														
Argent (Ag)	2	20	40	200	20	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	6	30	50	250	12	mg/kg	6	<5	<5	<5	<5	<5	6	7
Baryum (Ba)	340	500	2000	10000	500	mg/kg	120	94	120	65	65	99	110	82
Cadmium (Cd)	1.5	5	20	100	10	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrome (Cr)	100	250	800	4000	64	mg/kg	54	24	20	3	14	12	14	16
Cobalt (Co)	25	50	300	1500	50	mg/kg	8	6	7	<2	7	6	7	6
Cuivre (Cu)	50	100	500	2500	63	mg/kg	23	12	12	9	13	41	11	57
Étain (Sn)	5	50	300	1500	50	mg/kg	<4	<4	<4	<4	<4	<4	<4	<4
Manganèse (Mn)	1000	1000	2200	11000	--	mg/kg	910	310	870	62	280	390	560	530
Molybdène (Mo)	2	10	40	200	10	mg/kg	7	<1	<1	<1	2	1	2	1
Nickel (Ni)	50	100	500	2500	45	mg/kg	21	15	18	3	11	16	19	17
Plomb (Pb)	50	500	1000	5000	140	mg/kg	29	14	12	<5	8	6	25	50
Zinc (Zn)	140	500	1500	7500	200	mg/kg	74	46	38	<10	41	21	93	47
<b>HAP</b>														
Acénaphthène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Acénaphthylène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Anthracène	0.1	10	100	100	2.5	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Benzo(a)anthracène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.2	ND (0.1)
Benzo(a)pyrène	0.1	1	10	34	20	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.2	ND (0.1)
Benzo(b)fluoranthène	0.1	1	10	136	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.2	ND (0.1)
Benzo(j)fluoranthène	0.1	1	10	136	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Benzo(k)fluoranthène	0.1	1	10	136	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.1	ND (0.1)
Benzo(c)phénanthrène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Benzo(ghi)peryène	0.1	1	10	18	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.1	ND (0.1)
Chrysène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.2	ND (0.1)
Dibenzo(a,h)anthracène	0.1	1	10	82	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	0.1
Dibenzo(a,i)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Dibenzo(a,h)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Dibenzo(a,l)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
7,12-Diméthylbenzanthracène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Fluoranthène	0.1	10	100	100	50	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.5	ND (0.1)
Fluorène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	0.2
Indéno(1,2,3-cd)pyrène	0.1	1	10	34	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.1	ND (0.1)
3-Méthylcholanthrène	0.1	1	10	150	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Naphtalène	0.1	5	50	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	ND (0.1)
Phénanthrène	0.1	5	50	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.3	ND (0.1)
Pyrène	0.1	10	100	100	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	0.4	0.1
2-Méthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	0.2
1-Méthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	0.1
1,3-Diméthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	0.1
2,3,5-Triméthylnaphtalène	0.1	1	10	56	--	mg/kg	ND (0.1)	-	ND (0.1)	-	-	-	ND (0.1)	0.1
<b>Hydrocarbures Pétroliers</b>														
HP (C10-C50)	300	700	3500	10000	--	mg/kg	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)

**Notes:**  
A, B, C : Critères génériques du Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés du MDDELCC  
1 Limites de l'annexe I du "Règlement sur l'enfouissement des sols contaminés" (RESC);  
2 En raison que la récupération ou l'écart relatif (RPD) pour le cuivre et le plomb étaient dehors des limites de contrôle po Dup. de Lab, une reprise de l'analyse a été effectuée. Le nouveau échantillon a été nommé TR-02 VRE-1 (RÉPÉTÉ)  
3 Le Dup Lab correspond à une analyse réalisée par le Laboratoire aux fins du contrôle de la qualité et de la vérification de réalisée tel qu'indiqué dans les Lignes directrices concernant les travaux analytiques en chimie du Centre d'expertise en anal Québec dans le cadre du Programme d'accréditation des laboratoires d'analyse (PALA)

  Dépassement du critère A du MDDELCC  
  Dépassement du critère B du MDDELCC  
  Dépassement du critère C du MDDELCC  
  Dépassement des limites fixés à l'annexe I du RESC  
ND (0.01) : Paramètre non détecté (limite de détection)  
-- : Aucun critère  
- : Non analysé

**TABLEAU I**  
**RÉSUMÉ DES ANALYSES CHIMIQUES SUR LES SOLS**  
**CARACTÉRISATION ENVIRONNEMENTALE DES SOLS**  
**CANAL-DE SAINTE-ANNE-DE-BELLEVUE**  
**SAINTE-ANNE-DE-BELLEVUE, QC**

Sondage	F-05	F-06	F-07	F-07	F-07	F-07	TR-01	TR-02	TR-02
Échantillon	F-05 CFE-3	F-06 CFE-1	F-07 CFE-1	F-07 CFE-3	F-07 CFE-7	F-07 CFE-8	TR-01 VRE-1	TR-02 VRE-1	TR-02 VRE-1 RÉPÉTÉ (2)
Profondeur min (m ss)	1.22	0.00	0.00	1.52	3.81	4.57	0.18	0.05	0.05
Profondeur max (m ss)	1.83	0.13	0.61	2.13	4.42	4.90	1.00	0.80	0.80

Paramètre	MDDELCC			RESC Annexe I <sup>(1)</sup>	CCME (grains grossiers) Rés/Parc	Unités									
	A	B	C												
<b>HAM</b>															
Benzène	0.2	0.5	5	5	0.03	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.2)	-
Chlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,2-Dichlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,3-Dichlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,4-Dichlorobenzène	0.2	1	10	10	1	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Ethylbenzène	0.2	5	50	50	0.082	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Styrène	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Toluène	0.2	3	30	30	0.37	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Xylènes Totaux	0.4	5	50	50	11	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
<b>Hydrocarbures aliphatiques chlorés</b>															
Chloroforme	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Chlorure de vinyle	0.4	0.4	0.4	60	--	mg/kg	ND (0.02)	-	-	-	-	-	ND (0.02)	ND (0.4)	-
1,1-Dichloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,2-Dichloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,1-Dichloroéthylène	0.2	5	50	50	--	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,2-Dichloroéthylène (cis+trans)	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Dichlorométhane	--	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,2-Dichloropropane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,3-Dichloropropane (cis+trans)	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,1,2,2-Tétrachloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Tétrachloroéthylène	0.2	5	50	50	0.2	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Tétrachlorure de carbone	0.1	5	50	50	5	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.2)	-
1,1,1-Trichloroéthane	0.2	5	50	50	5	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
1,1,2-Trichloroéthane	0.2	5	50	50	--	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
Trichloroéthylène	0.2	5	50	50	0.01	mg/kg	ND (0.2)	-	-	-	-	-	ND (0.2)	ND (0.4)	-
<b>Phénols</b>															
o-Crésol	0.1	1	10	56	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
m-Crésol	0.1	1	10	56	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
p-Crésol	0.1	1	10	56	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,4-Diméthylphénol	0.1	1	10	140	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2-Nitrophénol	0.5	1	10	130	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
4-Nitrophénol	0.5	1	10	290	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
Phénol	0.1	1	10	62	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2-Chlorophénol	0.1	0.5	5	57	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
3-Chlorophénol	0.1	0.5	5	57	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
4-Chlorophénol	0.1	0.5	5	57	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,3-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,4 + 2,5-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,6-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
3,4-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
3,5-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
Pentachlorophénol	0.1	0.5	5	74	7.6	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,3,4,5-Tétrachlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,3,4,6-Tétrachlorophénol	0.1	0.5	5	74	0.5	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,3,5,6-Tétrachlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,3,4-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,3,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,3,6-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,4,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
2,4,6-Trichlorophénol	0.1	0.5	5	74	0.5	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-
3,4,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	ND (0.1)	-	-	-	-	-	ND (0.1)	ND (0.1)	-

**Notes:**

A, B, C : Critères génériques du Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés du MDDELCC

1 Limites de l'annexe I du "Règlement sur l'enfouissement des sols contaminés" (RESC);

2 En raison que la récupération ou l'écart relatif (RPD) pour le cuivre et le plomb étaient dehors des limites de contrôle po Dup. de Lab, une reprise de l'analyse a été effectuée. Le nouveau échantillon a été nommé TR-02 VRE-1 (RÉPÉTÉ)

3 Le Dup Lab correspond à une analyse réalisée par le Laboratoire aux fins du contrôle de la qualité et de la vérification de réalisée tel qu'indiqué dans les Lignes directrices concernant les travaux analytiques en chimie du Centre d'expertise en anal Québec dans le cadre du Programme d'accréditation des laboratoires d'analyse (PALA)

Dépassement du critère A du MDDELCC

Dépassement du critère B du MDDELCC

Dépassement du critère C du MDDELCC

Dépassement des limites fixés à l'annexe I du RESC

ND (0.01) : Paramètre non détecté (limite de détection)

-- : Aucun critère

- : Non analysé

**TABLEAU I**  
**RÉSUMÉ DES ANALYSES CHIMIQUES SUR LES SOLS**  
**CARACTÉRISATION ENVIRONNEMENTALE DES SOLS**  
**CANAL-DE SAINTE-ANNE-DE-BELLEVUE**  
**SAINTE-ANNE-DE-BELLEVUE, QC**

Sondage	TR-02	TR-03	TR-04	TR-05	Blanc Terrain
Échantillon	TR-02 VRE-1 Dup du Lab (3)	TR-03 VRE-1	TR-04 VRE-1	TR-05 VRE-3	-
Profondeur min (m ss)	0.05	0.05	0.05	1.00	-
Profondeur max (m ss)	0.80	1.50	0.15	1.80	-

Paramètre	MDDELCC			RESC Annexe I <sup>1)</sup>	CCME (grains grossiers) Rés/Parc	Unités						
	A	B	C									
<b>Métaux</b>												
Argent (Ag)	2	20	40	200	20	mg/kg	<0.5	<0.5	<0.5	<0.5	-	-
Arsenic (As)	6	30	50	250	12	mg/kg	5	<5	<5	5	-	-
Baryum (Ba)	340	500	2000	10000	500	mg/kg	73	78	78	80	-	-
Cadmium (Cd)	1.5	5	20	100	10	mg/kg	<0.5	<0.5	<0.5	<0.5	-	-
Chrome (Cr)	100	250	800	4000	64	mg/kg	14	14	22	22	-	-
Cobalt (Co)	25	50	300	1500	50	mg/kg	5	5	7	7	-	-
Cuivre (Cu)	50	100	500	2500	63	mg/kg	80	12	13	20	-	-
Étain (Sn)	5	50	300	1500	50	mg/kg	<4	6	<4	55	-	-
Manganèse (Mn)	1000	1000	2200	11000	--	mg/kg	470	430	450	690	-	-
Molybdène (Mo)	2	10	40	200	10	mg/kg	1	1	<1	2	-	-
Nickel (Ni)	50	100	500	2500	45	mg/kg	14	15	19	22	-	-
Plomb (Pb)	50	500	1000	5000	140	mg/kg	68	120	14	62	-	-
Zinc (Zn)	140	500	1500	7500	200	mg/kg	44	47	38	56	-	-
<b>HAP</b>												
Acénaphthène	0.1	10	100	100	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Acénaphthylène	0.1	10	100	100	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Anthracène	0.1	10	100	100	2.5	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Benzo(a)anthracène	0.1	1	10	34	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Benzo(a)pyrène	0.1	1	10	34	20	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Benzo(b)fluoranthène	0.1	1	10	136	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Benzo(j)fluoranthène	0.1	1	10	136	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Benzo(k)fluoranthène	0.1	1	10	136	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Benzo(c)phénanthrène	0.1	1	10	56	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Benzo(ghi)pérylène	0.1	1	10	18	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Chrysène	0.1	1	10	34	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Dibenzo(a,h)anthracène	0.1	1	10	82	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Dibenzo(a,i)pyrène	0.1	1	10	34	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Dibenzo(a,h)pyrène	0.1	1	10	34	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Dibenzo(a,l)pyrène	0.1	1	10	34	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
7,12-Diméthylbenzanthracène	0.1	1	10	34	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Fluoranthène	0.1	10	100	100	50	mg/kg	-	0.1	ND (0.1)	-	-	-
Fluorène	0.1	10	100	100	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Indéno(1,2,3-cd)pyrène	0.1	1	10	34	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
3-Méthylcholanthrène	0.1	1	10	150	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Naphtalène	0.1	5	50	56	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Phénanthrène	0.1	5	50	56	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
Pyrène	0.1	10	100	100	--	mg/kg	-	0.1	ND (0.1)	-	-	-
2-Méthylnaphtalène	0.1	1	10	56	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
1-Méthylnaphtalène	0.1	1	10	56	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
1,3-Diméthylnaphtalène	0.1	1	10	56	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
2,3,5-Triméthylnaphtalène	0.1	1	10	56	--	mg/kg	-	ND (0.1)	ND (0.1)	-	-	-
<b>Hydrocarbures Pétroliers</b>												
HP (C10-C50)	300	700	3500	10000	--	mg/kg	-	ND (100)	ND (100)	ND (100)	-	-

**Notes:**

A, B, C : Critères généraux du Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés du MDDELCC

1 Limites de l'annexe I du "Règlement sur l'enfouissement des sols contaminés" (RESC);

2 En raison que la récupération ou l'écart relatif (RPD) pour le cuivre et le plomb étaient dehors des limites de contrôle par Dup. de Lab, une reprise de l'analyse a été effectuée. Le nouveau échantillon a été nommé TR-02 VRE-1 (RÉPÉTÉ)

3 Le Dup Lab correspond à une analyse réalisée par le Laboratoire aux fins du contrôle de la qualité et de la vérification de réalisation tel qu'indiqué dans les Lignes directrices concernant les travaux analytiques en chimie du Centre d'expertise en anal Québec dans le cadre du Programme d'accréditation des laboratoires d'analyse (PALA)

Dépassement du critère A du MDDELCC  
 Dépassement du critère B du MDDELCC  
 Dépassement du critère C du MDDELCC  
 Dépassement des limites fixées à l'annexe I du RESC

ND (0.01) : Paramètre non détecté (limite de détection)

-- : Aucun critère

- : Non analysé



**TABLEAU I**  
**RÉSUMÉ DES ANALYSES CHIMIQUES SUR LES SOLS**  
**CARACTÉRISATION ENVIRONNEMENTALE DES SOLS**  
**CANAL-DE SAINTE-ANNE-DE-BELLEVUE**  
**SAINTE-ANNE-DE-BELLEVUE, QC**

Sondage	TR-02	TR-03	TR-04	TR-05	Blanc Terrain
Échantillon	TR-02 VRE-1 Dup du Lab (3)	TR-03 VRE-1	TR-04 VRE-1	TR-05 VRE-3	-
Profondeur min (m ss)	0.05	0.05	0.05	1.00	-
Profondeur max (m ss)	0.80	1.50	0.15	1.80	-

Paramètre	MDDELCC			RESC Annexe I <sup>14</sup>	CCME (grains grossiers) Rés/Parc	Unités						
	A	B	C									
<b>HAM</b>												
Benzène	0.2	0.5	5	5	0.03	mg/kg	-	-	ND (0.1)	-	ND (0.1)	
Chlorobenzène	0.2	1	10	10	1	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,2-Dichlorobenzène	0.2	1	10	10	1	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,3-Dichlorobenzène	0.2	1	10	10	1	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,4-Dichlorobenzène	0.2	1	10	10	1	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Éthylbenzène	0.2	5	50	50	0.082	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Styrène	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Toluène	0.2	3	30	30	0.37	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Xylènes Totaux	0.4	5	50	50	11	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
<b>Hydrocarbures aliphatiques chlorés</b>												
Chloroforme	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Chlorure de vinyle	0.4	0.4	0.4	60	--	mg/kg	-	-	ND (0.02)	-	ND (0.02)	
1,1-Dichloroéthane	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,2-Dichloroéthane	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,1-Dichloroéthylène	0.2	5	50	50	--	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,2-Dichloroéthylène (cis+trans)	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Dichlorométhane	--	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,2-Dichloropropane	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,3-Dichloropropane (cis+trans)	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,1,2,2-Tétrachloroéthane	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Tétrachloroéthylène	0.2	5	50	50	0.2	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Tétrachlorure de carbone	0.1	5	50	50	5	mg/kg	-	-	ND (0.1)	-	ND (0.1)	
1,1,1-Trichloroéthane	0.2	5	50	50	5	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
1,1,2-Trichloroéthane	0.2	5	50	50	--	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
Trichloroéthylène	0.2	5	50	50	0.01	mg/kg	-	-	ND (0.2)	-	ND (0.2)	
<b>Phénols</b>												
o-Crésol	0.1	1	10	56	--	mg/kg	-	-	ND (0.1)	-	-	
m-Crésol	0.1	1	10	56	--	mg/kg	-	-	ND (0.1)	-	-	
p-Crésol	0.1	1	10	56	--	mg/kg	-	-	ND (0.1)	-	-	
2,4-Diméthylphénol	0.1	1	10	140	--	mg/kg	-	-	ND (0.1)	-	-	
2-Nitrophénol	0.5	1	10	130	--	mg/kg	-	-	ND (0.1)	-	-	
4-Nitrophénol	0.5	1	10	290	--	mg/kg	-	-	ND (0.1)	-	-	
Phénol	0.1	1	10	62	--	mg/kg	-	-	ND (0.1)	-	-	
2-Chlorophénol	0.1	0.5	5	57	--	mg/kg	-	-	ND (0.1)	-	-	
3-Chlorophénol	0.1	0.5	5	57	--	mg/kg	-	-	ND (0.1)	-	-	
4-Chlorophénol	0.1	0.5	5	57	--	mg/kg	-	-	ND (0.1)	-	-	
2,3-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	-	-	ND (0.1)	-	-	
2,4 + 2,5-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	-	-	ND (0.1)	-	-	
2,6-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	-	-	ND (0.1)	-	-	
3,4-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	-	-	ND (0.1)	-	-	
3,5-Dichlorophénol	0.1	0.5	5	140	--	mg/kg	-	-	ND (0.1)	-	-	
Pentachlorophénol	0.1	0.5	5	74	7.6	mg/kg	-	-	ND (0.1)	-	-	
2,3,4,5-Tétrachlorophénol	0.1	0.5	5	74	--	mg/kg	-	-	ND (0.1)	-	-	
2,3,4,6-Tétrachlorophénol	0.1	0.5	5	74	0.5	mg/kg	-	-	ND (0.1)	-	-	
2,3,5,6-Tétrachlorophénol	0.1	0.5	5	74	--	mg/kg	-	-	ND (0.1)	-	-	
2,3,4-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	-	-	ND (0.1)	-	-	
2,3,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	-	-	ND (0.1)	-	-	
2,3,6-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	-	-	ND (0.1)	-	-	
2,4,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	-	-	ND (0.1)	-	-	
2,4,6-Trichlorophénol	0.1	0.5	5	74	0.5	mg/kg	-	-	ND (0.1)	-	-	
3,4,5-Trichlorophénol	0.1	0.5	5	74	--	mg/kg	-	-	ND (0.1)	-	-	

**Notes:**

A, B, C : Critères généraux du Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés du MDDELCC

1 Limites de l'annexe I du "Règlement sur l'enfouissement des sols contaminés" (RESC);

2 En raison que la récupération ou l'écart relatif (RPD) pour le cuivre et le plomb étaient dehors des limites de contrôle po Dup. de Lab, une reprise de l'analyse a été effectuée. Le nouveau échantillon a été nommé TR-02 VRE-1 (RÉPÉTÉ)

3 Le Dup Lab correspond à une analyse réalisée par le Laboratoire aux fins du contrôle de la qualité et de la vérification de réalisée tel qu'indiqué dans les Lignes directrices concernant les travaux analytiques en chimie du Centre d'expertise en anal Québec dans le cadre du Programme d'accréditation des laboratoires d'analyse (PALA)

Dépassement du critère A du MDDELCC  
 Dépassement du critère B du MDDELCC  
 Dépassement du critère C du MDDELCC  
 Dépassement des limites fixés à l'annexe I du RESC

ND (0.01) : Paramètre non détecté (limite de détection)

-- : Aucun critère

- : Non analysé

TABLEAU III  
COMPARAISON DES DUPLICATAS DES ÉCHANTILLONS DE SOLS  
CARACTÉRISATION ENVIRONNEMENTALE DES SOLS  
CANAL-DE SAINTE-ANNE-DE-BELLEVUE  
SAINTE-ANNE-DE-BELLEVUE, QC

<i>Emplacement de l'échantillon:</i>			<i>F-07</i>		<i>F-07</i>	
<i>Numéro d'échantillon:</i>			<i>CFE-1</i>		<i>Duplicata 2</i>	
<i>Profondeur:</i>			<i>0.00 - 0.61</i>		<i>0.00 - 0.61</i>	<i>ÉCART (%)</i>
<i>Date d'échantillonnage:</i>			<i>10 MARS 2017</i>		<i>10 MARS 2017</i>	
					<i>(Duplicata)</i>	
<i>Paramètres</i>	<i>Unités</i>	<i>LDR (Original)</i>		<i>LDR (Duplicata)</i>		
<b>HAP</b>						
Acénaphène		0.10	<0.1	0.10	<0.1	NC
Acénaphylène		0.10	<0.1	0.10	<0.1	NC
Anthracène		0.10	<0.1	0.10	<0.1	NC
Benzo(a)anthracène		0.10	<0.1	0.10	<0.1	NC
Benzo(a)pyrène		0.10	<0.1	0.10	<0.1	NC
Benzo(b)fluoranthène		0.10	<0.1	0.10	<0.1	NC
Benzo(j)fluoranthène		0.10	<0.1	0.10	<0.1	NC
Benzo(k)fluoranthène		0.10	<0.1	0.10	<0.1	NC
Benzo(c)phénanthrène		0.10	<0.1	0.10	<0.1	NC
Benzo(ghi)pérylène		0.10	<0.1	0.10	<0.1	NC
Chrysène		0.10	<0.1	0.10	<0.1	NC
Dibenz(a,h)anthracène		0.10	<0.1	0.10	<0.1	NC
Dibenzo(a,i)pyrène		0.10	<0.1	0.10	<0.1	NC
Dibenzo(a,h)pyrène		0.10	<0.1	0.10	<0.1	NC
Dibenzo(a,l)pyrène		0.10	<0.1	0.10	<0.1	NC
7,12-Diméthylbenzanthracène		0.10	<0.1	0.10	<0.1	NC
Fluoranthène		0.10	<0.1	0.10	<0.1	NC
Fluorène		0.10	<0.1	0.10	<0.1	NC
Indéno(1,2,3-cd)pyrène		0.10	<0.1	0.1	<0.1	NC
3-Méthylcholanthrène		0.10	<0.1	0.1	<0.1	NC
Naphtalène		0.10	<0.1	0.01	0.99	NC
Phénanthrène		0.10	<0.1	0.04	<0.04	NC
Pyrène		0.10	<0.1	0.1	<0.1	NC
2-Méthylnaphtalène		0.10	<0.1	0.10	2.9	NC
1-Méthylnaphtalène		0.10	<0.1	0.10	2	NC
1,3-Diméthylnaphtalène		0.10	<0.1	0.10	1.5	NC
2,3,5-Triméthylnaphtalène		0.10	<0.1	0.10	0.1	NC
<b>Pourcentage de composés qui ont des écarts de plus de 30% et qui sont 10 fois la limite de détection:</b>						<b>0%</b>

TABLEAU III  
 COMPARAISON DES DUPLICATAS DES ÉCHANTILLONS DE SOLS  
 CARACTÉRISATION ENVIRONNEMENTALE DES SOLS  
 CANAL-DE SAINTE-ANNE-DE-BELLEVUE  
 SAINTE-ANNE-DE-BELLEVUE, QC

**Emplacement de l'échantillon:**  
**Numéro d'échantillon:**  
**Profondeur:**  
**Date d'échantillonnage:**

**F-07**  
**CFE-1**  
**0.00 - 0.61**  
**10 MARS 2017**

**F-07**  
**Duplicata 2**  
**0.00 - 0.61**  
**10 MARS 2017**  
**(Duplicata)**

**ÉCART (%)**

<b>Paramètres</b>	<b>Unités</b>	<b>LDR (Original)</b>		<b>LDR (Duplicata)</b>		
<b>Métaux</b>						
Argent (Ag)		0.5	<0.5	0.5	<0.5	NC
Arsenic (As)		5	<5	5	<5	NC
Baryum (Ba)		5	120	5	77	43.65
Cadmium (Cd)		0.5	<0.5	0.5	<0.5	NC
Chrome (Cr)		2	20	2	10	NC
Cobalt (Co)		2	7	2	6	NC
Cuivre (Cu)		2	12	2	16	NC
Etain (Sn)		4	<4	4	<4	NC
Manganèse (Mn)		2	870	2	370	80.65
Molybdène (Mo)		1	<1	1	<1	NC
Nickel (Ni)		1	18	1	19	5.41
Plomb (Pb)		5	12	5	6	NC
Zinc (Zn)		10	38	10	46	NC
<b>Hydrocarbures pétroliers</b>						
Hydrocarbures pétroliers (C <sub>10</sub> -C <sub>50</sub> )		100	<100	100	<100	NC

**Notes:**

NC: Non calculé. L'écart n'a pas été calculé car le résultat n'est pas supérieur à 10 x la limite de détection. Les limites sont basées sur les limites du CEAEQ pour les duplicatas de laboratoire.

ND: Non détecté

--: Pas de résultats

**25.00** Écart inférieur aux recommandations du CEAEQ

**80.00** Écart supérieur aux recommandations du CEAEQ

TABLEAU II  
COMPARAISON DES DUPLICATAS DES ÉCHANTILLONS DE SOLS  
CARACTÉRISATION ENVIRONNEMENTALE DES SOLS  
CANAL-DE SAINTE-ANNE-DE-BELLEVUE  
SAINTE-ANNE-DE-BELLEVUE, QC

<i>Emplacement de l'échantillon:</i>			<i>F-01</i>		<i>F-01</i>	
<i>Numéro d'échantillon:</i>			<i>CFE-3</i>		<i>DUP-1</i>	
<i>Profondeur:</i>			<i>1.22 - 1.75</i>		<i>1.22 - 1.75</i>	<i>ÉCART (%)</i>
<i>Date d'échantillonnage:</i>			<i>9 MARS 2017</i>		<i>9 MARS 2017</i>	
					<i>(Duplicata)</i>	
<i>Paramètres</i>	<i>Unités</i>	<i>LDR (Original)</i>		<i>LDR (Duplicata)</i>		
<i>HAP</i>						
Acénaphène		0.1	<0.1	0.1	<0.1	NC
Acénaphylène		0.1	<0.1	0.1	<0.1	NC
Anthracène		0.1	<0.1	0.1	<0.1	NC
Benzo(a)anthracène		0.1	<0.1	0.1	<0.1	NC
Benzo(a)pyrène		0.1	<0.1	0.1	<0.1	NC
Benzo(b)fluoranthène		0.1	<0.1	0.1	<0.1	NC
Benzo(j)fluoranthène		0.1	<0.1	0.1	<0.1	NC
Benzo(k)fluoranthène		0.1	<0.1	0.1	<0.1	NC
Benzo(c)phénanthrène		0.1	<0.1	0.1	<0.1	NC
Benzo(ghi)pérylène		0.1	<0.1	0.1	<0.1	NC
Chrysène		0.1	<0.1	0.1	0.13	NC
Dibenz(a,h)anthracène		0.1	<0.1	0.1	<0.1	NC
Dibenzo(a,i)pyrène		0.1	<0.1	0.1	<0.1	NC
Dibenzo(a,h)pyrène		0.1	<0.1	0.1	<0.1	NC
Dibenzo(a,l)pyrène		0.1	<0.1	0.1	<0.1	NC
7,12-Diméthylbenzanthracène		0.1	<0.1	0.1	<0.1	NC
Fluoranthène		0.1	<0.1	0.1	0.23	NC
Fluorène		0.1	<0.1	0.1	<0.1	NC
Indéno(1,2,3-cd)pyrène		0.1	<0.1	0.1	<0.1	NC
3-Méthylcholanthrène		0.1	<0.1	0.1	<0.1	NC
Naphtalène		0.1	<0.1	0.1	<0.1	NC
Phénanthrène		0.1	<0.1	0.1	<0.1	NC
Pyrène		0.1	<0.1	0.1	0.2	NC
2-Méthylnaphtalène		0.1	<0.1	0.1	<0.1	NC
1-Méthylnaphtalène		0.1	<0.1	0.1	<0.1	NC
1,3-Diméthylnaphtalène		0.1	<0.1	0.1	<0.1	NC
2,3,5-Triméthylnaphtalène		0.1	<0.1	0.1	<0.1	NC
<b>Pourcentage de composés qui ont des écarts de plus de 30% et qui sont 10 fois la limite de détection:</b>						<b>0%</b>

TABLEAU II  
COMPARAISON DES DUPLICATAS DES ÉCHANTILLONS DE SOLS  
CARACTÉRISATION ENVIRONNEMENTALE DES SOLS  
CANAL-DE SAINTE-ANNE-DE-BELLEVUE  
SAINTE-ANNE-DE-BELLEVUE, QC

**Emplacement de l'échantillon:**  
**Numéro d'échantillon:**  
**Profondeur:**  
**Date d'échantillonnage:**

**F-01**  
**CFE-3**  
**1.22 - 1.75**  
**9 MARS 2017**

**F-01**  
**DUP-1**  
**1.22 - 1.75**  
**9 MARS 2017**  
**(Duplicata)**

**ÉCART (%)**

<b>Paramètres</b>	<b>Unités</b>	<b>LDR (Original)</b>		<b>LDR (Duplicata)</b>		
<b>Métaux</b>						
Argent (Ag)		0.5	<0.5	0.5	<0.50	NC
Arsenic (As)		5	<5	5	<5.0	NC
Baryum (Ba)		5	89	5	77	14.46
Cadmium (Cd)		0.5	<0.5	0.5	<0.50	NC
Chrome (Cr)		2	23	2	27	16.00
Cobalt (Co)		2	5	2	6.4	NC
Cuivre (Cu)		2	13	2	26	NC
Etain (Sn)		4	<4	4	<4.0	NC
Manganèse (Mn)		2	280	2	370	27.69
Molybdène (Mo)		1	2	1	2.7	NC
Nickel (Ni)		1	12	1	20	50.00
Plomb (Pb)		5	40	5	130	NC
Zinc (Zn)		10	110	10	180	48.28

**Hydrocarbures pétroliers**

Hydrocarbures pétroliers (C <sub>10</sub> -C <sub>50</sub> )		100	250	100	350	NC
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**Notes:**

NC: Non calculé. L'écart n'a pas été calculé car le résultat n'est pas supérieur à 10 x la limite de détection. Les limites sont basées sur les limites du CEAEQ pour les duplicatas de laboratoire.

ND: Non détecté

--: Pas de résultats

**25.00** Écart inférieur aux recommandations du CEAEQ

**80.00** Écart supérieur aux recommandations du CEAEQ

Appendix D  
Certificates of Chemical Analyses (Maxxam  
Analytique Inc.) (in French)



Grille de gestion des sols excavés  
(juillet 2016)

du Ministère du Développement durable, de l'Environnement  
et de la Lutte contre les changements climatiques

Niveau de contamination	Options de gestion
<b>≤ critère A<sup>1</sup></b>	<ol style="list-style-type: none"> <li>Utilisation sans restriction.</li> </ol>
<b>&lt; critère B (valeurs limites de l'annexe I du RPRT)</b>	<ol style="list-style-type: none"> <li>Ailleurs que sur le terrain d'origine, les sols ne peuvent être déposés que sur des sols dont la concentration en contaminants est égale ou supérieure à celle des sols remblayés (article 4 du RSCTSC) et s'ils n'émettent pas d'odeurs d'hydrocarbures perceptibles.</li> <li>Aux mêmes conditions, déposés sur ou dans des terrains destinés à l'habitation s'ils sont utilisés comme matériau de remblayage dans le cadre de travaux de réhabilitation de terrains faits conformément à la LQE.</li> </ol>
<b>≤ critère B (valeurs limites de l'annexe I du RPRT)</b>	<ol style="list-style-type: none"> <li>Valorisés sur le terrain d'origine ou sur le terrain à partir duquel a eu lieu l'activité à l'origine de la contamination.</li> <li>Valorisés comme matériau de recouvrement journalier ou final dans un lieu d'enfouissement technique (LET) ou comme matériau de recouvrement hebdomadaire ou final dans un lieu d'enfouissement en tranchée ou comme recouvrement mensuel ou final dans un lieu d'enfouissement de débris de construction ou de démolition, conformément au REIMR aux conditions des articles 42, 50, 90, 91, 105 ou 106.</li> <li>Valorisés comme recouvrement final dans un lieu d'enfouissement de sols contaminés (LESC) aux conditions décrites à l'article 38 du RESC ou valorisés dans un système de captage des gaz prévu à l'article 13 du RESC.</li> <li>Valorisés comme recouvrement final d'un lieu de dépôt définitif de matières dangereuses aux conditions de l'article 101 du RMD.</li> <li>Valorisés comme matériau de recouvrement final dans un système de gestion qui comporte le dépôt définitif par enfouissement de déchets de fabriques de pâtes et papiers, aux conditions de l'article 116 du Règlement sur les fabriques de pâtes et papiers (RFPP).</li> <li>Valorisés sur un lieu d'élimination nécessitant un recouvrement, aux conditions prévues au certificat d'autorisation en vertu de l'article 22 de la LQE.</li> <li>Valorisés avec ou sans MRF, comme matériau apte à la végétation dans des projets de restauration d'aires d'accumulation de résidus miniers<sup>2</sup> ou dans la couverture de lieux visés par le RFPP, le RESC ou le RMD. Ne doit dégager aucune odeur d'hydrocarbures perceptible. Dans le cas d'ajout de MRF, le projet doit être autorisé et respecter le <i>Guide sur l'utilisation de matières résiduelles fertilisantes pour la restauration de la couverture végétale de lieux dégradés</i><sup>3</sup>.</li> <li>Valorisés comme couche de protection d'une géomembrane utilisée dans un système multicouche lors de la restauration d'une aire d'accumulation de résidus miniers générateurs d'acide.<sup>2</sup></li> <li>Éliminés dans un lieu d'enfouissement visé par le RESC.</li> <li>Éliminés dans un LET, un lieu d'enfouissement en tranchée, un lieu d'enfouissement en milieu nordique, un lieu d'enfouissement de débris de construction ou de démolition ou un lieu d'enfouissement en territoire isolé, conformément à l'article 4 du REIMR.</li> </ol>
<b>≥ critère B et ≤ critère C</b>	<ol style="list-style-type: none"> <li>Utilisés sur le terrain d'origine comme matériau de remblayage à la condition que les concentrations mesurées respectent les critères ou valeurs limites réglementaires applicables aux sols selon l'usage et le zonage.</li> <li>Valorisés comme matériau de recouvrement dans un LET ou comme matériau de recouvrement hebdomadaire dans un lieu d'enfouissement en tranchée, aux conditions des articles 42, 50 ou 90 du REIMR. Ces conditions incluent notamment que les concentrations de composés organiques volatils soient égales ou inférieures aux critères B.</li> <li>Traités sur place ou dans un lieu de traitement autorisé.</li> <li>Éliminés dans un lieu d'enfouissement visé par le RESC.</li> </ol>



Grille de gestion des sols excavés  
(juillet 2016)  
du Ministère du Développement durable, de l'Environnement  
et de la Lutte contre les changements climatiques

Niveau de contamination	Options de gestion
<b>&lt; annexe I du RESC</b>	<ol style="list-style-type: none"><li>1. Utilisés pour remplir des dépressions naturelles ou des excavations sur le terrain d'origine lors de travaux de réhabilitation aux conditions prévues dans le plan de réhabilitation approuvé dans le cadre d'une analyse de risques (dossiers GTE), à la condition que les C<sub>10</sub>-C<sub>50</sub> et les COV respectent les critères d'usage.</li><li>2. Traités sur place ou dans un lieu de traitement autorisé.</li><li>3. Éliminés dans un lieu d'enfouissement visé par le RESC.</li></ol>
<b>≥ annexe I du RESC</b>	<ol style="list-style-type: none"><li>1. Décontaminés sur place ou dans un lieu de traitement autorisé et gestion selon le résultat obtenu. Si cela est impossible, éliminés dans un lieu d'enfouissement visé par le RESC pour les exceptions mentionnées à l'article 4.1<sup>o</sup> a, b ou c.</li></ol>
<b>Cas particuliers</b>	<ol style="list-style-type: none"><li>1. Des sols contaminés peuvent être utilisés, à condition de ne dégager aucune odeur d'hydrocarbures perceptible, pour la construction d'un écran visuel ou antibruit dont l'utilité est démontrée :<ol style="list-style-type: none"><li>a. Sur un terrain résidentiel avec des sols du terrain d'origine :<ol style="list-style-type: none"><li>i. dont les concentrations sont ≤ B;</li><li>ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols contiennent des concentrations ≤ B en C<sub>10</sub>-C<sub>50</sub> et en composés organiques volatils (COV)<sup>4</sup>;</li><li>iii. dont les concentrations sont &lt; annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient de niveau &gt; C et que les sols déposés contiennent des concentrations ≤ B en C<sub>10</sub>-C<sub>50</sub> et en COV<sup>4</sup>;</li></ol></li><li>b. Sur un terrain commercial/industriel avec des sols du terrain d'origine :<ol style="list-style-type: none"><li>i. dont les concentrations sont ≤ C;</li><li>ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement;</li><li>iii. dont les concentrations sont &lt; annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient &gt; C, et que les sols déposés contiennent des concentrations ≤ C en C<sub>10</sub>-C<sub>50</sub> et en COV<sup>4</sup>.</li></ol></li></ol></li><li>2. La valorisation de sols contaminés dans un procédé en remplacement d'une matière vierge est possible aux conditions de l'autorisation.</li><li>3. Les sols ≥ B peuvent être acheminés sur les aires de résidus miniers, s'ils sont contaminés exclusivement par des métaux ou métalloïdes résultant des activités minières de l'entreprise responsable de l'aire, aux conditions de l'autorisation délivrée par le Ministère (article 6 du RSCTSC).</li><li>4. Les sols ≥ B peuvent être acheminés dans un lieu de dépôt définitif de matières dangereuses aux conditions du certificat d'autorisation détenu par ce lieu pour recevoir des sols.</li></ol>

Note : S'il y a présence de matières résiduelles dans les sols, se référer à la figure 12 de la section 7.7.2.

<sup>1</sup> S'il est établi que la concentration naturelle dans le sol importé est supérieure au critère A et à la concentration du sol récepteur, il est recommandé au propriétaire du terrain récepteur de garder une trace du remblayage (localisation, niveau de contamination, provenance des sols importés), de façon à ce qu'il puisse, le cas échéant, démontrer qu'il ne s'agit pas d'une contamination anthropique. Faute de l'existence d'une telle trace, le Ministère considérera que les sols ont été contaminés par l'activité humaine et ils devront donc être gérés comme tels. Advenant le cas où les concentrations naturelles excèdent largement les critères génériques

recommandés pour l'usage qui est fait du terrain récepteur, un avis sur les possibles risques à la santé et l'à-propos du remblayage avec de tels sols pourra être demandé à la direction de santé publique.

<sup>2</sup> Ne s'applique pas aux sols contaminés = B, à moins que ces sols n'aient d'abord transité par un lieu visé à l'article 6 du Règlement sur le stockage et les centres de transfert de sols contaminés. Les sols excavés = B ne peuvent en effet être acheminés directement que dans des lieux légalement autorisés à les recevoir et listés à l'article 6 du RSCTSC.

<sup>3</sup> Il faudra toutefois s'assurer que la valorisation de sols A-B, auxquels on aura ajouté des matières fertilisantes ou non, entraîne un effet bénéfique, par exemple, sur la croissance de la végétation, et que ces sols répondent à un besoin réel, l'ajout de sols n'étant pas essentiel dans tous les cas de restauration minière. Il sera possible de s'assurer du bien-fondé du projet de valorisation et de son contrôle dans le cadre du certificat d'autorisation délivré préalablement à sa réalisation.

<sup>4</sup> L'écran visuel ou antibruit doit être recouvert de 1 m de sols = A ou de 40 cm = A aux endroits recouverts d'une structure permanente (asphalte ou béton). Il est possible d'utiliser des MRF dans la couche apte à la végétation selon les orientations du *Guide sur l'utilisation des matières résiduelles fertilisantes pour la restauration de la couverture végétale des lieux dégradés* si la résultante est = A.

Votre # de commande: 76206148  
 Votre # du projet: 11131157-A1  
 Adresse du site: TETRATECH  
 Votre # Bordereau: E-931428, E-931429

**Attention: Alexandre Fiorilli**

GHD Consultants Ltée  
 MONTRÉAL  
 4600 COTE VERTU  
 SUITE 200  
 VILLE ST-LAURENT, QC  
 H4S 1C7

**Date du rapport: 2017/04/20**  
 # Rapport: R2270010  
 Version: 2 - Révisé

**CERTIFICAT D'ANALYSE – RÉVISÉ**

**# DE DOSSIER MAXXAM: B713923**

**Reçu: 2017/03/17, 13:10**

Matrice: SOL  
 Nombre d'échantillons reçus: 21

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
COV-Conservation au MeOH sur le terrain (1)*	5	N/A	2017/03/20	STL SOP-00145	MA.400–COV 2.0 R4 m
COV-Conservation au MeOH sur le terrain (1)*	1	N/A	2017/03/23	STL SOP-00145	MA.400–COV 2.0 R4 m
Hydrocarbures pétroliers (C10-C50)*	8	2017/03/20	2017/03/20	STL SOP-00172	MA.400–HYD. 1.1 R3 m
Hydrocarbures pétroliers (C10-C50)*	12	2017/03/20	2017/03/21	STL SOP-00172	MA.400–HYD. 1.1 R3 m
Métaux extractibles totaux par ICP*	16	2017/03/20	2017/03/21	STL SOP-00006	MA.200–Mét. 1.2 R5 m
Métaux extractibles totaux par ICP*	3	2017/03/21	2017/03/21	STL SOP-00006	MA.200–Mét. 1.2 R5 m
Métaux extractibles totaux par ICP*	1	2017/03/22	2017/03/22	STL SOP-00006	MA.200–Mét. 1.2 R5 m
Hydrocarbures aromatiques polycycliques*	10	2017/03/20	2017/03/21	STL SOP-00178	MA.400–HAP 1.1 R5 m
Composés acides (Phénols)*	5	2017/03/20	2017/03/21	STL SOP-00135	MA.400–Phé 1.0 R3 m

**Remarques:**

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.

Les résultats s'appliquent seulement aux échantillons analysés.

Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

Votre # de commande: 76206148  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # Bordereau: E-931428, E-931429

**Attention: Alexandre Fiorilli**

GHD Consultants Ltée  
MONTRÉAL  
4600 COTE VERTU  
SUITE 200  
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H4S 1C7

**Date du rapport: 2017/04/20**  
# Rapport: R2270010  
Version: 2 - Révisé

**CERTIFICAT D'ANALYSE – RÉVISÉ**

**# DE DOSSIER MAXXAM: B713923**

**Reçu: 2017/03/17, 13:10**

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

(1) Aucune date d'extraction n'est fournie pour les analyses de F1/BTEX et COV lorsque les sols sont conservés dans le méthanol sur le terrain. La date d'extraction correspond à la date d'échantillonnage à moins d'indication contraire.

\* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDELCC.

clé de cryptage

Veillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets  
Karima Dlimi, B.Sc., chimiste, Chargée de projets  
Courriel: KDlimi@maxxam.ca  
Téléphone (514)448-9001 Ext:6270

=====  
Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9655		DS9657			
Date d'échantillonnage						2017/03/09		2017/03/08			
# Bordereau						E-931428		E-931428			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>F-01 CFE-3</b>	<b>CR</b>	<b>F-02 CFE-2</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	21		12		N/A	N/A
<b>HAP</b>											
Acénaphène	mg/kg	0.28	0.28	0.28	0.28	<0.1		0.1	<Agr	0.1	1738835
Acénaphthylène	mg/kg	320	320	320	320	<0.1		<0.1		0.1	1738835
Anthracène	mg/kg	2.5	2.5	32	32	<0.1		0.4	<Agr	0.1	1738835
Benzo(a)anthracène	mg/kg	0.1	1	10	10	<0.1		0.5	Agr-Res	0.1	1738835
Benzo(a)pyrène	mg/kg	0.7	0.7	1.4	1.4	<0.1		0.4	<Agr	0.1	1738835
Benzo(b)fluoranthène	mg/kg	0.1	1	10	10	<0.1		0.4	Agr-Res	0.1	1738835
Benzo(j)fluoranthène	mg/kg	0.1	1	10	10	<0.1		0.2	Agr-Res	0.1	1738835
Benzo(k)fluoranthène	mg/kg	0.1	1	10	10	<0.1		0.2	Agr-Res	0.1	1738835
Benzo(b+j+k)fluoranthène	mg/kg	-	-	-	-	<0.1		0.8		0.1	1738835
Benzo(c)phénanthrène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
Benzo(ghi)pérylène	mg/kg	-	-	-	-	<0.1		0.3		0.1	1738835
Chrysène	mg/kg	-	-	-	-	<0.1		0.5		0.1	1738835
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	10	<0.1		<0.1		0.1	1738835
Dibenzo(a,i)pyrène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
Dibenzo(a,h)pyrène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
Dibenzo(a,l)pyrène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
7,12-Diméthylbenzanthracène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
Fluoranthène	mg/kg	50	50	180	180	<0.1		1.5	<Agr	0.1	1738835
Fluorène	mg/kg	0.25	0.25	0.25	0.25	<0.1		0.2	<Agr	0.1	1738835
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	10	<0.1		0.3	Agr-Res	0.1	1738835
3-Méthylcholanthrène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
Naphtalène	mg/kg	0.013	0.013	0.013	0.013	<0.1		0.1	>Ind	0.1	1738835
Phénanthrène	mg/kg	0.046	0.046	0.046	0.046	<0.1		1.7	>Ind	0.1	1738835
Pyrène	mg/kg	0.1	10	100	100	<0.1		1.0	Agr-Res	0.1	1738835
2-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
1-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
1,3-Diméthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
2,3,5-Triméthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738835
<b>Récupération des Surrogates (%)</b>											
D10-Anthracène	%	-	-	-	-	84		86		N/A	1738835
D12-Benzo(a)pyrène	%	-	-	-	-	84		88		N/A	1738835
D14-Terphenyl	%	-	-	-	-	84		86		N/A	1738835
LDR = Limite de détection rapportée											
Lot CQ = Lot contrôle qualité											
N/A = Non Applicable											

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9655		DS9657			
Date d'échantillonnage						2017/03/09		2017/03/08			
# Bordereau						E-931428		E-931428			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>F-01 CFE-3</b>	<b>CR</b>	<b>F-02 CFE-2</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D8-Acenaphthylene	%	-	-	-	-	82		84		N/A	1738835
D8-Naphtalène	%	-	-	-	-	86		84		N/A	1738835
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable											

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9659			DS9661			
Date d'échantillonnage						2017/03/13			2017/03/08			
# Bordereau						E-931428			E-931428			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>F-03 CFE-1</b>	<b>CR</b>	<b>Lot CQ</b>	<b>F-05 CFE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	21		N/A	31		N/A	N/A
<b>HAP</b>												
Acénaphène	mg/kg	0.28	0.28	0.28	0.28	<0.1		1738888	<0.1		0.1	1738835
Acénaphylène	mg/kg	320	320	320	320	<0.1		1738888	<0.1		0.1	1738835
Anthracène	mg/kg	2.5	2.5	32	32	<0.1		1738888	<0.1		0.1	1738835
Benzo(a)anthracène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(a)pyrène	mg/kg	0.7	0.7	1.4	1.4	<0.1		1738888	<0.1		0.1	1738835
Benzo(b)fluoranthène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(j)fluoranthène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(k)fluoranthène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(b+j+k)fluoranthène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Benzo(c)phénanthrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Benzo(ghi)pérylène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Chrysène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,i)pyrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,h)pyrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,l)pyrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
7,12-Diméthylbenzanthracène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Fluoranthène	mg/kg	50	50	180	180	<0.1		1738888	<0.1		0.1	1738835
Fluorène	mg/kg	0.25	0.25	0.25	0.25	<0.1		1738888	<0.1		0.1	1738835
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
3-Méthylcholanthrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Naphtalène	mg/kg	0.013	0.013	0.013	0.013	<0.1		1738888	<0.1		0.1	1738835
Phénanthrène	mg/kg	0.046	0.046	0.046	0.046	<0.1		1738888	<0.1		0.1	1738835
Pyrène	mg/kg	0.1	10	100	100	<0.1		1738888	<0.1		0.1	1738835
2-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
1-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
1,3-Diméthylnaphtalène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
2,3,5-Triméthylnaphtalène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
<b>Récupération des Surrogates (%)</b>												
D10-Anthracène	%	-	-	-	-	86		1738888	90		N/A	1738835
D12-Benzo(a)pyrène	%	-	-	-	-	82		1738888	94		N/A	1738835
D14-Terphenyl	%	-	-	-	-	76		1738888	90		N/A	1738835
LDR = Limite de détection rapportée												
Lot CQ = Lot contrôle qualité												
N/A = Non Applicable												

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9659			DS9661			
Date d'échantillonnage						2017/03/13			2017/03/08			
# Bordereau						E-931428			E-931428			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>F-03 CFE-1</b>	<b>CR</b>	<b>Lot CQ</b>	<b>F-05 CFE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D8-Acenaphthylene	%	-	-	-	-	80		1738888	86		N/A	1738835
D8-Naphtalène	%	-	-	-	-	80		1738888	88		N/A	1738835
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable												

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9662		DS9679		DS9682			
Date d'échantillonnage						2017/03/09		2017/03/10		2017/03/09			
# Bordereau						E-931428		E-931429		E-931429			
	Unités	Agr	Res	Com	Ind	F-05 CFE-3	CR	F-07 CFE-1	CR	TR-01 VRE-1	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	27		15		12		N/A	N/A
<b>HAP</b>													
Acénaphène	mg/kg	0.28	0.28	0.28	0.28	<0.1		<0.1		<0.1		0.1	1738888
Acénaphthylène	mg/kg	320	320	320	320	<0.1		<0.1		<0.1		0.1	1738888
Anthracène	mg/kg	2.5	2.5	32	32	<0.1		<0.1		<0.1		0.1	1738888
Benzo(a)anthracène	mg/kg	0.1	1	10	10	<0.1		<0.1		0.2	Agr-Res	0.1	1738888
Benzo(a)pyrène	mg/kg	0.7	0.7	1.4	1.4	<0.1		<0.1		0.2	<Agr	0.1	1738888
Benzo(b)fluoranthène	mg/kg	0.1	1	10	10	<0.1		<0.1		0.2	Agr-Res	0.1	1738888
Benzo(j)fluoranthène	mg/kg	0.1	1	10	10	<0.1		<0.1		<0.1		0.1	1738888
Benzo(k)fluoranthène	mg/kg	0.1	1	10	10	<0.1		<0.1		0.1	Agr	0.1	1738888
Benzo(b+j+k)fluoranthène	mg/kg	-	-	-	-	<0.1		<0.1		0.3		0.1	1738888
Benzo(c)phénanthrène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
Benzo(ghi)pérylène	mg/kg	-	-	-	-	<0.1		<0.1		0.1		0.1	1738888
Chrysène	mg/kg	-	-	-	-	<0.1		<0.1		0.2		0.1	1738888
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	10	<0.1		<0.1		<0.1		0.1	1738888
Dibenzo(a,i)pyrène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
Dibenzo(a,h)pyrène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
Dibenzo(a,l)pyrène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
7,12-Diméthylbenzanthracène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
Fluoranthène	mg/kg	50	50	180	180	<0.1		<0.1		0.5	<Agr	0.1	1738888
Fluorène	mg/kg	0.25	0.25	0.25	0.25	<0.1		<0.1		<0.1		0.1	1738888
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	10	<0.1		<0.1		0.1	Agr	0.1	1738888
3-Méthylcholanthrène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
Naphtalène	mg/kg	0.013	0.013	0.013	0.013	<0.1		<0.1		<0.1		0.1	1738888
Phénanthrène	mg/kg	0.046	0.046	0.046	0.046	<0.1		<0.1		0.3	>Ind	0.1	1738888
Pyrène	mg/kg	0.1	10	100	100	<0.1		<0.1		0.4	Agr-Res	0.1	1738888
2-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
1-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
1,3-Diméthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
2,3,5-Triméthylnaphtalène	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		0.1	1738888
<b>Récupération des Surrogates (%)</b>													
D10-Anthracène	%	-	-	-	-	90		86		88		N/A	1738888
D12-Benzo(a)pyrène	%	-	-	-	-	90		86		86		N/A	1738888
D14-Terphenyl	%	-	-	-	-	74		72		72		N/A	1738888
LDR = Limite de détection rapportée													
Lot CQ = Lot contrôle qualité													
N/A = Non Applicable													

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9662		DS9679		DS9682			
Date d'échantillonnage						2017/03/09		2017/03/10		2017/03/09			
# Bordereau						E-931428		E-931429		E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>F-05 CFE-3</b>	<b>CR</b>	<b>F-07 CFE-1</b>	<b>CR</b>	<b>TR-01 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D8-Acenaphthylene	%	-	-	-	-	80		78		80		N/A	1738888
D8-Naphtalène	%	-	-	-	-	80		78		78		N/A	1738888

LDR = Limite de détection rapportée  
Lot CQ = Lot contrôle qualité  
N/A = Non Applicable

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9683			DS9684			
Date d'échantillonnage						2017/03/09			2017/03/08			
# Bordereau						E-931429			E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-02 VRE-1</b>	<b>CR</b>	<b>Lot CQ</b>	<b>TR-03 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	15		N/A	16		N/A	N/A
<b>HAP</b>												
Acénaphène	mg/kg	0.28	0.28	0.28	0.28	<0.1		1738888	<0.1		0.1	1738835
Acénaphylène	mg/kg	320	320	320	320	<0.1		1738888	<0.1		0.1	1738835
Anthracène	mg/kg	2.5	2.5	32	32	<0.1		1738888	<0.1		0.1	1738835
Benzo(a)anthracène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(a)pyrène	mg/kg	0.7	0.7	1.4	1.4	<0.1		1738888	<0.1		0.1	1738835
Benzo(b)fluoranthène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(j)fluoranthène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(k)fluoranthène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Benzo(b+j+k)fluoranthène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Benzo(c)phénanthrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Benzo(ghi)pérylène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Chrysène	mg/kg	-	-	-	-	0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,i)pyrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,h)pyrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Dibenzo(a,l)pyrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
7,12-Diméthylbenzanthracène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Fluoranthène	mg/kg	50	50	180	180	0.2	<Agr	1738888	0.1	<Agr	0.1	1738835
Fluorène	mg/kg	0.25	0.25	0.25	0.25	<0.1		1738888	<0.1		0.1	1738835
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	10	<0.1		1738888	<0.1		0.1	1738835
3-Méthylcholanthrène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
Naphtalène	mg/kg	0.013	0.013	0.013	0.013	<0.1		1738888	<0.1		0.1	1738835
Phénanthrène	mg/kg	0.046	0.046	0.046	0.046	0.1	>Ind	1738888	<0.1		0.1	1738835
Pyrène	mg/kg	0.1	10	100	100	0.2	Agr-Res	1738888	0.1	Agr	0.1	1738835
2-Méthylnaphtalène	mg/kg	-	-	-	-	0.1		1738888	<0.1		0.1	1738835
1-Méthylnaphtalène	mg/kg	-	-	-	-	0.1		1738888	<0.1		0.1	1738835
1,3-Diméthylnaphtalène	mg/kg	-	-	-	-	0.1		1738888	<0.1		0.1	1738835
2,3,5-Triméthylnaphtalène	mg/kg	-	-	-	-	<0.1		1738888	<0.1		0.1	1738835
<b>Récupération des Surrogates (%)</b>												
D10-Anthracène	%	-	-	-	-	88		1738888	84		N/A	1738835
D12-Benzo(a)pyrène	%	-	-	-	-	82		1738888	80		N/A	1738835
D14-Terphenyl	%	-	-	-	-	76		1738888	82		N/A	1738835
LDR = Limite de détection rapportée												
Lot CQ = Lot contrôle qualité												
N/A = Non Applicable												

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9683			DS9684			
Date d'échantillonnage						2017/03/09			2017/03/08			
# Bordereau						E-931429			E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-02 VRE-1</b>	<b>CR</b>	<b>Lot CQ</b>	<b>TR-03 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D8-Acenaphthylene	%	-	-	-	-	80		1738888	82		N/A	1738835
D8-Naphtalène	%	-	-	-	-	82		1738888	84		N/A	1738835
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable												

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9685			
Date d'échantillonnage						2017/03/08			
# Bordereau						E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-04 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	12		N/A	N/A
<b>HAP</b>									
Acénaphène	mg/kg	0.28	0.28	0.28	0.28	<0.1		0.1	1738835
Acénaphylène	mg/kg	320	320	320	320	<0.1		0.1	1738835
Anthracène	mg/kg	2.5	2.5	32	32	<0.1		0.1	1738835
Benzo(a)anthracène	mg/kg	0.1	1	10	10	<0.1		0.1	1738835
Benzo(a)pyrène	mg/kg	0.7	0.7	1.4	1.4	<0.1		0.1	1738835
Benzo(b)fluoranthène	mg/kg	0.1	1	10	10	<0.1		0.1	1738835
Benzo(j)fluoranthène	mg/kg	0.1	1	10	10	<0.1		0.1	1738835
Benzo(k)fluoranthène	mg/kg	0.1	1	10	10	<0.1		0.1	1738835
Benzo(b+j+k)fluoranthène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Benzo(c)phénanthrène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Benzo(ghi)pérylène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Chrysène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	10	<0.1		0.1	1738835
Dibenzo(a,i)pyrène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Dibenzo(a,h)pyrène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Dibenzo(a,l)pyrène	mg/kg	-	-	-	-	<0.1		0.1	1738835
7,12-Diméthylbenzanthracène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Fluoranthène	mg/kg	50	50	180	180	<0.1		0.1	1738835
Fluorène	mg/kg	0.25	0.25	0.25	0.25	<0.1		0.1	1738835
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	10	<0.1		0.1	1738835
3-Méthylcholanthrène	mg/kg	-	-	-	-	<0.1		0.1	1738835
Naphtalène	mg/kg	0.013	0.013	0.013	0.013	<0.1		0.1	1738835
Phénanthrène	mg/kg	0.046	0.046	0.046	0.046	<0.1		0.1	1738835
Pyrène	mg/kg	0.1	10	100	100	<0.1		0.1	1738835
2-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		0.1	1738835
1-Méthylnaphtalène	mg/kg	-	-	-	-	<0.1		0.1	1738835
1,3-Diméthylnaphtalène	mg/kg	-	-	-	-	<0.1		0.1	1738835
2,3,5-Triméthylnaphtalène	mg/kg	-	-	-	-	<0.1		0.1	1738835
<b>Récupération des Surrogates (%)</b>									
D10-Anthracène	%	-	-	-	-	84		N/A	1738835
D12-Benzo(a)pyrène	%	-	-	-	-	84		N/A	1738835
D14-Terphenyl	%	-	-	-	-	84		N/A	1738835
LDR = Limite de détection rapportée									
Lot CQ = Lot contrôle qualité									
N/A = Non Applicable									

Dossier Maxxam: B713923  
 Date du rapport: 2017/04/20

GHD Consultants Ltée  
 Votre # du projet: 11131157-A1  
 Adresse du site: TETRATECH  
 Votre # de commande: 76206148  
 Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam						DS9685			
Date d'échantillonnage						2017/03/08			
# Bordereau						E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-04 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D8-Acenaphthylene	%	-	-	-	-	80		N/A	1738835
D8-Naphtalène	%	-	-	-	-	82		N/A	1738835
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable									

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

### PHÉNOLS PAR GCMS (SOL)

ID Maxxam						DS9655		DS9662		DS9682		DS9683			
Date d'échantillonnage						2017/03/09		2017/03/09		2017/03/09		2017/03/09			
# Bordereau						E-931428		E-931428		E-931429		E-931429			
	Unités	Agr	Res	Com	Ind	F-01 CFE-3	CR	F-05 CFE-3	CR	TR-01 VRE-1	CR	TR-02 VRE-1	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	21		27		12		15		N/A	N/A
<b>PHÉNOLS</b>															
o-Crésol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
m-Crésol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
p-Crésol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,4-Diméthylphénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2-Nitrophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
4-Nitrophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
Phénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2-Chlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
3-Chlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
4-Chlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,3-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,4 + 2,5-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,6-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
3,4-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
3,5-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
Pentachlorophénol	mg/kg	7.6	7.6	7.6	7.6	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,3,4,5-Tétrachlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,3,4,6-Tétrachlorophénol	mg/kg	0.05	0.5	5	5	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,3,5,6-Tétrachlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,3,4-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,3,5-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,3,6-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,4,5-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
2,4,6-Trichlorophénol	mg/kg	0.05	0.5	5	5	<0.1		<0.1		<0.1		<0.1		0.1	1738866
3,4,5-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		<0.1		<0.1		0.1	1738866
<b>Récupération des Surrogates (%)</b>															
D6-Phénol	%	-	-	-	-	97		89		95		90		N/A	1738866
Tribromophénol-2,4,6	%	-	-	-	-	112		107		111		106		N/A	1738866
Trifluoro-m-crésol	%	-	-	-	-	95		91		94		89		N/A	1738866
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable															

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**PHÉNOLS PAR GCMS (SOL)**

ID Maxxam						DS9683		DS9685			
Date d'échantillonnage						2017/03/09		2017/03/08			
# Bordereau						E-931429		E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-02 VRE-1 Dup. de Lab.</b>	<b>CR</b>	<b>TR-04 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	15		12		N/A	N/A
<b>PHÉNOLS</b>											
o-Crésol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
m-Crésol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
p-Crésol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,4-Diméthylphénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2-Nitrophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
4-Nitrophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
Phénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2-Chlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
3-Chlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
4-Chlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,3-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,4 + 2,5-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,6-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
3,4-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
3,5-Dichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
Pentachlorophénol	mg/kg	7.6	7.6	7.6	7.6	<0.1		<0.1		0.1	1738866
2,3,4,5-Tétrachlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,3,4,6-Tétrachlorophénol	mg/kg	0.05	0.5	5	5	<0.1		<0.1		0.1	1738866
2,3,5,6-Tétrachlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,3,4-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,3,5-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,3,6-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,4,5-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
2,4,6-Trichlorophénol	mg/kg	0.05	0.5	5	5	<0.1		<0.1		0.1	1738866
3,4,5-Trichlorophénol	mg/kg	-	-	-	-	<0.1		<0.1		0.1	1738866
<b>Récupération des Surrogates (%)</b>											
D6-Phénol	%	-	-	-	-	93		89		N/A	1738866
Tribromophénol-2,4,6	%	-	-	-	-	108		106		N/A	1738866
Trifluoro-m-crésol	%	-	-	-	-	92		89		N/A	1738866
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité Duplicata de laboratoire N/A = Non Applicable											

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

### HYDROCARBURES PAR GCFID (SOL)

ID Maxxam		DS9655		DS9656	DS9656		DS9657	DS9658		
Date d'échantillonnage		2017/03/09		2017/03/09	2017/03/09		2017/03/08	2017/03/08		
# Bordereau		E-931428		E-931428	E-931428		E-931428	E-931428		
	Unités	F-01 CFE-3	Lot CQ	F-01 CFE-8	F-01 CFE-8 Dup. de Lab.	Lot CQ	F-02 CFE-2	F-02 CFE-8	LDR	Lot CQ
% HUMIDITÉ	%	21	N/A	29	29	N/A	12	8.6	N/A	N/A
<b>HYDROCARBURES PÉTROLIERS</b>										
Hydrocarbures pétroliers (C10-C50)	mg/kg	250	1738834	<100	<100	1738887	380	<100	100	1738834
<b>Récupération des Surrogates (%)</b>										
1-Chlorooctadécane	%	84	1738834	90	94	1738887	85	86	N/A	1738834
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité Duplicata de laboratoire N/A = Non Applicable										

ID Maxxam		DS9659	DS9660		DS9661		DS9662	DS9663		
Date d'échantillonnage		2017/03/13	2017/03/13		2017/03/08		2017/03/09	2017/03/13		
# Bordereau		E-931428	E-931428		E-931428		E-931428	E-931428		
	Unités	F-03 CFE-1	F-03 CFE-4	Lot CQ	F-05 CFE-1	Lot CQ	F-05 CFE-3	F-03 CFE-3	LDR	Lot CQ
% HUMIDITÉ	%	21	41	N/A	31	N/A	27	26	N/A	N/A
<b>HYDROCARBURES PÉTROLIERS</b>										
Hydrocarbures pétroliers (C10-C50)	mg/kg	120	<100	1738887	<100	1738834	<100	<100	100	1738887
<b>Récupération des Surrogates (%)</b>										
1-Chlorooctadécane	%	95	86	1738887	87	1738834	86	88	N/A	1738887
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable										

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
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Initiales du préleveur: FA

### HYDROCARBURES PAR GCFID (SOL)

ID Maxxam		DS9664	DS9677		DS9678		DS9679	DS9680		
Date d'échantillonnage		2017/03/10	2017/03/10		2017/03/08		2017/03/10	2017/03/10		
# Bordereau		E-931428	E-931429		E-931429		E-931429	E-931429		
	Unités	F-06 CFE-1	F-07 CFE-8	Lot CQ	F-02 CFE-5	Lot CQ	F-07 CFE-1	F-07 CFE-3	LDR	Lot CQ
% HUMIDITÉ	%	26	9.3	N/A	19	N/A	15	14	N/A	N/A
<b>HYDROCARBURES PÉTROLIERS</b>										
Hydrocarbures pétroliers (C10-C50)	mg/kg	<100	<100	1738887	<100	1738834	<100	<100	100	1738887
<b>Récupération des Surrogates (%)</b>										
1-Chlorooctadécane	%	88	91	1738887	90	1738834	88	89	N/A	1738887
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable										

ID Maxxam		DS9681	DS9682	DS9683	DS9683		DS9684	DS9685		
Date d'échantillonnage		2017/03/10	2017/03/09	2017/03/09	2017/03/09		2017/03/08	2017/03/08		
# Bordereau		E-931429	E-931429	E-931429	E-931429		E-931429	E-931429		
	Unités	F-07 CFE-7	TR-01 VRE-1	TR-02 VRE-1	TR-02 VRE-1 Dup. de Lab.	Lot CQ	TR-03 VRE-1	TR-04 VRE-1	LDR	Lot CQ
% HUMIDITÉ	%	24	12	15	15	N/A	16	12	N/A	N/A
<b>HYDROCARBURES PÉTROLIERS</b>										
Hydrocarbures pétroliers (C10-C50)	mg/kg	<100	<100	<100	<100	1738887	<100	<100	100	1738834
<b>Récupération des Surrogates (%)</b>										
1-Chlorooctadécane	%	90	89	83	91	1738887	84	83	N/A	1738834
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité Duplicata de laboratoire N/A = Non Applicable										

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
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Votre # de commande: 76206148  
Initiales du préleveur: FA

**HYDROCARBURES PAR GCFID (SOL)**

ID Maxxam		DS9686		
Date d'échantillonnage		2017/03/08		
# Bordereau		E-931429		
	<b>Unités</b>	<b>TR-05 VRE-3</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	15	N/A	N/A
<b>HYDROCARBURES PÉTROLIERS</b>				
Hydrocarbures pétroliers (C10-C50)	mg/kg	<100	100	1738834
<b>Récupération des Surrogates (%)</b>				
1-Chlorooctadécane	%	84	N/A	1738834
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable				

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**COV PAR GC/MS (SOL)**

ID Maxxam						DS9655		DS9662		DS9682			
Date d'échantillonnage						2017/03/09		2017/03/09		2017/03/09			
# Bordereau						E-931428		E-931428		E-931429			
	Unités	Agr	Res	Com	Ind	F-01 CFE-3	CR	F-05 CFE-3	CR	TR-01 VRE-1	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	21		27		12		N/A	N/A
<b>VOLATILS</b>													
Benzène	mg/kg	0.0095	0.0095	0.030	0.030	<0.1		<0.1		<0.1		0.1	1738864
Chlorobenzène	mg/kg	0.1	1	10	10	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,2 benzène	mg/kg	0.1	1	10	10	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,3 benzène	mg/kg	0.1	1	10	10	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,4 benzène	mg/kg	0.1	1	10	10	<0.2		<0.2		<0.2		0.2	1738864
Éthylbenzène	mg/kg	0.082	0.082	0.082	0.082	<0.2		<0.2		<0.2		0.2	1738864
Styrène	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Toluène	mg/kg	0.37	0.37	0.37	0.37	<0.2		<0.2		<0.2		0.2	1738864
Xylènes (o,m,p)	mg/kg	11	11	11	11	<0.2		<0.2		<0.2		0.2	1738864
Chloroforme	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Chlorure de vinyle (chloroéthène)	mg/kg	-	-	-	-	<0.02		<0.02		<0.02		0.02	1738864
Dichloro-1,1 éthane	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,2 éthane	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,1 éthène	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,2 éthène (cis)	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,2 éthène (trans)	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,2 éthène (cis et trans)	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichlorométhane	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,2 propane	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,3 propène (cis)	mg/kg	-	-	-	-	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,3 propène (trans)	mg/kg	-	-	-	-	<0.2		<0.2		<0.2		0.2	1738864
Dichloro-1,3 propène (cis et trans)	mg/kg	-	-	-	-	<0.2		<0.2		<0.2		0.2	1738864
Tétrachloro-1,1,2,2 éthane	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Tétrachloroéthène	mg/kg	0.1	0.2	0.5	0.6	<0.2		<0.2		<0.2		0.2	1738864
Tétrachlorure de carbone	mg/kg	0.1	5	50	50	<0.1		<0.1		<0.1		0.1	1738864
Trichloro-1,1,1 éthane	mg/kg	0.1	5	50	50	<0.2		<0.2		<0.2		0.2	1738864
Trichloro-1,1,2 éthane	mg/kg	-	-	-	-	<0.2		<0.2		<0.2		0.2	1738864
Trichloroéthène	mg/kg	0.01	0.01	0.01	0.01	<0.2		<0.2		<0.2		0.2	1738864
<b>Récupération des Surrogates (%)</b>													
4-Bromofluorobenzène	%	-	-	-	-	108		108		107		N/A	1738864
D10-Ethylbenzène	%	-	-	-	-	86		86		80		N/A	1738864
LDR = Limite de détection rapportée													
Lot CQ = Lot contrôle qualité													
N/A = Non Applicable													

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
 Votre # du projet: 11131157-A1  
 Adresse du site: TETRATECH  
 Votre # de commande: 76206148  
 Initiales du préleveur: FA

**COV PAR GC/MS (SOL)**

ID Maxxam						DS9655		DS9662		DS9682			
Date d'échantillonnage						2017/03/09		2017/03/09		2017/03/09			
# Bordereau						E-931428		E-931428		E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>F-01 CFE-3</b>	<b>CR</b>	<b>F-05 CFE-3</b>	<b>CR</b>	<b>TR-01 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D4-1,2-Dichloroéthane	%	-	-	-	-	83		78		81		N/A	1738864
D8-Toluène	%	-	-	-	-	95		95		109		N/A	1738864

LDR = Limite de détection rapportée

Lot CQ = Lot contrôle qualité

N/A = Non Applicable

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**COV PAR GC/MS (SOL)**

ID Maxxam						DS9683			DS9685			
Date d'échantillonnage						2017/03/09			2017/03/08			
# Bordereau						E-931429			E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-02 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>TR-04 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	15		N/A	12		N/A	N/A
<b>VOLATILS</b>												
Benzène	mg/kg	0.0095	0.0095	0.030	0.030	<0.2		0.2	<0.1		0.1	1738864
Chlorobenzène	mg/kg	0.1	1	10	10	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,2 benzène	mg/kg	0.1	1	10	10	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,3 benzène	mg/kg	0.1	1	10	10	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,4 benzène	mg/kg	0.1	1	10	10	<0.4		0.4	<0.2		0.2	1738864
Éthylbenzène	mg/kg	0.082	0.082	0.082	0.082	<0.4		0.4	<0.2		0.2	1738864
Styrène	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Toluène	mg/kg	0.37	0.37	0.37	0.37	<0.4		0.4	<0.2		0.2	1738864
Xylènes (o,m,p)	mg/kg	11	11	11	11	<0.4		0.4	<0.2		0.2	1738864
Chloroforme	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Chlorure de vinyle (chloroéthène)	mg/kg	-	-	-	-	<0.04		0.04	<0.02		0.02	1738864
Dichloro-1,1 éthane	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,2 éthane	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,1 éthène	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,2 éthène (cis)	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,2 éthène (trans)	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,2 éthène (cis et trans)	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichlorométhane	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,2 propane	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,3 propène (cis)	mg/kg	-	-	-	-	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,3 propène (trans)	mg/kg	-	-	-	-	<0.4		0.4	<0.2		0.2	1738864
Dichloro-1,3 propène (cis et trans)	mg/kg	-	-	-	-	<0.4		0.4	<0.2		0.2	1738864
Tétrachloro-1,1,2,2 éthane	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Tétrachloroéthène	mg/kg	0.1	0.2	0.5	0.6	<0.4		0.4	<0.2		0.2	1738864
Tétrachlorure de carbone	mg/kg	0.1	5	50	50	<0.2		0.2	<0.1		0.1	1738864
Trichloro-1,1,1 éthane	mg/kg	0.1	5	50	50	<0.4		0.4	<0.2		0.2	1738864
Trichloro-1,1,2 éthane	mg/kg	-	-	-	-	<0.4		0.4	<0.2		0.2	1738864
Trichloroéthène	mg/kg	0.01	0.01	0.01	0.01	<0.4		0.4	<0.2		0.2	1738864
<b>Récupération des Surrogates (%)</b>												
4-Bromofluorobenzène	%	-	-	-	-	107		N/A	107		N/A	1738864
D10-Ethylbenzène	%	-	-	-	-	85		N/A	83		N/A	1738864
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable												

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**COV PAR GC/MS (SOL)**

ID Maxxam						DS9683			DS9685			
Date d'échantillonnage						2017/03/09			2017/03/08			
# Bordereau						E-931429			E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-02 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>TR-04 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D4-1,2-Dichloroéthane	%	-	-	-	-	79		N/A	79		N/A	1738864
D8-Toluène	%	-	-	-	-	113		N/A	106		N/A	1738864
LDR = Limite de détection rapportée												
Lot CQ = Lot contrôle qualité												
N/A = Non Applicable												

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**COV PAR GC/MS (SOL)**

ID Maxxam						DS9687			
Date d'échantillonnage						2017/03/10			
# Bordereau						E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>BLANC DE TERRAIN</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
<b>VOLATILS</b>									
Benzène	mg/kg	0.0095	0.0095	0.030	0.030	<0.1		0.1	1740514
Chlorobenzène	mg/kg	0.1	1	10	10	<0.2		0.2	1740514
Dichloro-1,2 benzène	mg/kg	0.1	1	10	10	<0.2		0.2	1740514
Dichloro-1,3 benzène	mg/kg	0.1	1	10	10	<0.2		0.2	1740514
Dichloro-1,4 benzène	mg/kg	0.1	1	10	10	<0.2		0.2	1740514
Éthylbenzène	mg/kg	0.082	0.082	0.082	0.082	<0.2		0.2	1740514
Styrène	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Toluène	mg/kg	0.37	0.37	0.37	0.37	<0.2		0.2	1740514
Xylènes (o,m,p)	mg/kg	11	11	11	11	<0.2		0.2	1740514
Chloroforme	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Chlorure de vinyle (chloroéthène)	mg/kg	-	-	-	-	<0.02		0.02	1740514
Dichloro-1,1 éthane	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichloro-1,2 éthane	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichloro-1,1 éthène	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichloro-1,2 éthène (cis)	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichloro-1,2 éthène (trans)	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichloro-1,2 éthène (cis et trans)	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichlorométhane	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichloro-1,2 propane	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Dichloro-1,3 propène (cis)	mg/kg	-	-	-	-	<0.2		0.2	1740514
Dichloro-1,3 propène (trans)	mg/kg	-	-	-	-	<0.2		0.2	1740514
Dichloro-1,3 propène (cis et trans)	mg/kg	-	-	-	-	<0.2		0.2	1740514
Tétrachloro-1,1,2,2 éthane	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Tétrachloroéthène	mg/kg	0.1	0.2	0.5	0.6	<0.2		0.2	1740514
Tétrachlorure de carbone	mg/kg	0.1	5	50	50	<0.1		0.1	1740514
Trichloro-1,1,1 éthane	mg/kg	0.1	5	50	50	<0.2		0.2	1740514
Trichloro-1,1,2 éthane	mg/kg	-	-	-	-	<0.2		0.2	1740514
Trichloroéthène	mg/kg	0.01	0.01	0.01	0.01	<0.2		0.2	1740514
<b>Récupération des Surrogates (%)</b>									
4-Bromofluorobenzène	%	-	-	-	-	98		N/A	1740514
D10-Ethylbenzène	%	-	-	-	-	75		N/A	1740514
D4-1,2-Dichloroéthane	%	-	-	-	-	81		N/A	1740514
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GHD Consultants Ltée  
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Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**COV PAR GC/MS (SOL)**

ID Maxxam						DS9687			
Date d'échantillonnage						2017/03/10			
# Bordereau						E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>BLANC DE TERRAIN</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D8-Toluène	%	-	-	-	-	91		N/A	1740514
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable									

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
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Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

ID Maxxam						DS9655		DS9656		DS9657			
Date d'échantillonnage						2017/03/09		2017/03/09		2017/03/08			
# Bordereau						E-931428		E-931428		E-931428			
	Unités	Agr	Res	Com	Ind	F-01 CFE-3	CR	F-01 CFE-8	CR	F-02 CFE-2	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	21		29		12		N/A	N/A
<b>MÉTAUX</b>													
Argent (Ag)	mg/kg	20	20	40	40	<0.5		<0.5		<0.5		0.5	1738849
Arsenic (As)	mg/kg	12	12	12	12	<5		<5		<5		5	1738849
Baryum (Ba)	mg/kg	750	500	2000	2000	89	<Agr	180	<Agr	130	<Agr	5	1738849
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		<0.5		<0.5		0.5	1738849
Chrome (Cr)	mg/kg	64	64	87	87	23	<Agr	100	>Ind	14	<Agr	2	1738849
Cobalt (Co)	mg/kg	40	50	300	300	5	<Agr	20	<Agr	5	<Agr	2	1738849
Cuivre (Cu)	mg/kg	63	63	94	94	13	<Agr	46	<Agr	19	<Agr	2	1738849
Etain (Sn)	mg/kg	5	50	300	300	<4		<4		<4		4	1738849
Manganèse (Mn)	mg/kg	-	-	-	-	280		550		690		2	1738849
Molybdène (Mo)	mg/kg	5	10	40	40	2	<Agr	<1		1	<Agr	1	1738849
Nickel (Ni)	mg/kg	50	50	50	50	12	<Agr	59	>Ind	13	<Agr	1	1738849
Plomb (Pb)	mg/kg	70	140	260	600	40	<Agr	10	<Agr	100	Agr-Res	5	1738849
Zinc (Zn)	mg/kg	200	200	200	200	110	<Agr	88	<Agr	120	<Agr	10	1738849
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable													

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
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Votre # de commande: 76206148  
Initiales du préleveur: FA

### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

ID Maxxam						DS9658			DS9659		DS9660			
Date d'échantillonnage						2017/03/08			2017/03/13		2017/03/13			
# Bordereau						E-931428			E-931428		E-931428			
	Unités	Agr	Res	Com	Ind	F-02 CFE-8	CR	LDR	F-03 CFE-1	CR	F-03 CFE-4	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	8.6		N/A	21		41		N/A	N/A
<b>MÉTAUX</b>														
Argent (Ag)	mg/kg	20	20	40	40	<0.5		0.5	<0.5		<0.5		0.5	1738849
Arsenic (As)	mg/kg	12	12	12	12	7	<Agr	5	<5		<5		5	1738849
Baryum (Ba)	mg/kg	750	500	2000	2000	36	<Agr	5	190	<Agr	180	<Agr	5	1738849
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		0.5	<0.5		<0.5		0.5	1738849
Chrome (Cr)	mg/kg	64	64	87	87	21	<Agr	2	19	<Agr	77	Res-Com	2	1738849
Cobalt (Co)	mg/kg	40	50	300	300	540	>Ind	20	4	<Agr	19	<Agr	2	1738849
Cuivre (Cu)	mg/kg	63	63	94	94	8300	>Ind	2	11	<Agr	40	<Agr	2	1738849
Etain (Sn)	mg/kg	5	50	300	300	200	Res-Com	4	<4		<4		4	1738849
Manganèse (Mn)	mg/kg	-	-	-	-	1400		2	1700		750		2	1738849
Molybdène (Mo)	mg/kg	5	10	40	40	76	>Ind	1	2	<Agr	<1		1	1738849
Nickel (Ni)	mg/kg	50	50	50	50	310	>Ind	1	14	<Agr	48	<Agr	1	1738849
Plomb (Pb)	mg/kg	70	140	260	600	6	<Agr	5	18	<Agr	10	<Agr	5	1738849
Zinc (Zn)	mg/kg	200	200	200	200	5700	>Ind	100	55	<Agr	97	<Agr	10	1738849
LDR = Limite de détection rapportée														
Lot CQ = Lot contrôle qualité														
N/A = Non Applicable														

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
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Votre # de commande: 76206148  
Initiales du préleveur: FA

**MÉTAUX EXTRACTIBLES TOTAUX (SOL)**

ID Maxxam						DS9661		DS9662		DS9663			
Date d'échantillonnage						2017/03/08		2017/03/09		2017/03/13			
# Bordereau						E-931428		E-931428		E-931428			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>F-05 CFE-1</b>	<b>CR</b>	<b>F-05 CFE-3</b>	<b>CR</b>	<b>F-03 CFE-3</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	31		27		26		N/A	N/A
<b>MÉTAUX</b>													
Argent (Ag)	mg/kg	20	20	40	40	<0.5		<0.5		<0.5		0.5	1738849
Arsenic (As)	mg/kg	12	12	12	12	<5		6	<Agr	<5		5	1738849
Baryum (Ba)	mg/kg	750	500	2000	2000	97	<Agr	120	<Agr	97	<Agr	5	1738849
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		<0.5		<0.5		0.5	1738849
Chrome (Cr)	mg/kg	64	64	87	87	27	<Agr	54	<Agr	18	<Agr	2	1738849
Cobalt (Co)	mg/kg	40	50	300	300	6	<Agr	8	<Agr	6	<Agr	2	1738849
Cuivre (Cu)	mg/kg	63	63	94	94	14	<Agr	23	<Agr	11	<Agr	2	1738849
Etain (Sn)	mg/kg	5	50	300	300	<4		<4		<4		4	1738849
Manganèse (Mn)	mg/kg	-	-	-	-	270		910		660		2	1738849
Molybdène (Mo)	mg/kg	5	10	40	40	<1		7	Agr-Res	<1		1	1738849
Nickel (Ni)	mg/kg	50	50	50	50	16	<Agr	21	<Agr	14	<Agr	1	1738849
Plomb (Pb)	mg/kg	70	140	260	600	13	<Agr	29	<Agr	53	<Agr	5	1738849
Zinc (Zn)	mg/kg	200	200	200	200	52	<Agr	74	<Agr	63	<Agr	10	1738849
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable													

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
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Initiales du préleveur: FA

**MÉTAUX EXTRACTIBLES TOTAUX (SOL)**

ID Maxxam						DS9664		DS9677		DS9678			
Date d'échantillonnage						2017/03/10		2017/03/10		2017/03/08			
# Bordereau						E-931428		E-931429		E-931429			
	Unités	Agr	Res	Com	Ind	F-06 CFE-1	CR	F-07 CFE-8	CR	F-02 CFE-5	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	26		9.3		19		N/A	N/A
<b>MÉTAUX</b>													
Argent (Ag)	mg/kg	20	20	40	40	<0.5		<0.5		<0.5		0.5	1738849
Arsenic (As)	mg/kg	12	12	12	12	<5		<5		<5		5	1738849
Baryum (Ba)	mg/kg	750	500	2000	2000	94	<Agr	99	<Agr	27	<Agr	5	1738849
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		<0.5		<0.5		0.5	1738849
Chrome (Cr)	mg/kg	64	64	87	87	24	<Agr	12	<Agr	7	<Agr	2	1738849
Cobalt (Co)	mg/kg	40	50	300	300	6	<Agr	6	<Agr	3	<Agr	2	1738849
Cuivre (Cu)	mg/kg	63	63	94	94	12	<Agr	11	<Agr	5	<Agr	2	1738849
Etain (Sn)	mg/kg	5	50	300	300	<4		<4		<4		4	1738849
Manganèse (Mn)	mg/kg	-	-	-	-	310		390		100		2	1738849
Molybdène (Mo)	mg/kg	5	10	40	40	<1		1	<Agr	<1		1	1738849
Nickel (Ni)	mg/kg	50	50	50	50	15	<Agr	16	<Agr	5	<Agr	1	1738849
Plomb (Pb)	mg/kg	70	140	260	600	14	<Agr	6	<Agr	<5		5	1738849
Zinc (Zn)	mg/kg	200	200	200	200	46	<Agr	21	<Agr	10	<Agr	10	1738849
LDR = Limite de détection rapportée													
Lot CQ = Lot contrôle qualité													
N/A = Non Applicable													

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
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Votre # de commande: 76206148  
Initiales du préleveur: FA

### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

ID Maxxam						DS9679		DS9680		DS9681			
Date d'échantillonnage						2017/03/10		2017/03/10		2017/03/10			
# Bordereau						E-931429		E-931429		E-931429			
	Unités	Agr	Res	Com	Ind	F-07 CFE-1	CR	F-07 CFE-3	CR	F-07 CFE-7	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	15		14		24		N/A	N/A
<b>MÉTAUX</b>													
Argent (Ag)	mg/kg	20	20	40	40	<0.5		<0.5		<0.5		0.5	1738849
Arsenic (As)	mg/kg	12	12	12	12	<5		<5		<5		5	1738849
Baryum (Ba)	mg/kg	750	500	2000	2000	120	<Agr	65	<Agr	65	<Agr	5	1738849
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		<0.5		<0.5		0.5	1738849
Chrome (Cr)	mg/kg	64	64	87	87	20	<Agr	3	<Agr	14	<Agr	2	1738849
Cobalt (Co)	mg/kg	40	50	300	300	7	<Agr	<2		7	<Agr	2	1738849
Cuivre (Cu)	mg/kg	63	63	94	94	12	<Agr	9	<Agr	41	<Agr	2	1738849
Etain (Sn)	mg/kg	5	50	300	300	<4		<4		<4		4	1738849
Manganèse (Mn)	mg/kg	-	-	-	-	870		62		280		2	1738849
Molybdène (Mo)	mg/kg	5	10	40	40	<1		<1		2	<Agr	1	1738849
Nickel (Ni)	mg/kg	50	50	50	50	18	<Agr	3	<Agr	11	<Agr	1	1738849
Plomb (Pb)	mg/kg	70	140	260	600	12	<Agr	<5		8	<Agr	5	1738849
Zinc (Zn)	mg/kg	200	200	200	200	38	<Agr	<10		41	<Agr	10	1738849
LDR = Limite de détection rapportée													
Lot CQ = Lot contrôle qualité													
N/A = Non Applicable													

Dossier Maxxam: B713923  
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GHD Consultants Ltée  
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Votre # de commande: 76206148  
Initiales du préleveur: FA

**MÉTAUX EXTRACTIBLES TOTAUX (SOL)**

ID Maxxam						DS9682		DS9683			DS9683			
Date d'échantillonnage						2017/03/09		2017/03/09			2017/03/09			
# Bordereau						E-931429		E-931429			E-931429			
	Unités	Agr	Res	Com	Ind	TR-01 VRE-1	CR	TR-02 VRE-1	CR	Lot CQ	TR-02 VRE-1 RÉPÉTÉ	CR	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	-	12		15		N/A	15		N/A	N/A
<b>MÉTAUX</b>														
Argent (Ag)	mg/kg	20	20	40	40	<0.5		<0.5		1738849	<0.5		0.5	1740044
Arsenic (As)	mg/kg	12	12	12	12	<5		6	<Agr	1738849	7	<Agr	5	1740044
Baryum (Ba)	mg/kg	750	500	2000	2000	110	<Agr	82	<Agr	1738849	82	<Agr	5	1740044
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		<0.5		1738849	<0.5		0.5	1740044
Chrome (Cr)	mg/kg	64	64	87	87	14	<Agr	16	<Agr	1738849	15	<Agr	2	1740044
Cobalt (Co)	mg/kg	40	50	300	300	7	<Agr	6	<Agr	1738849	6	<Agr	2	1740044
Cuivre (Cu)	mg/kg	63	63	94	94	13	<Agr	57	<Agr	1738849	110	>Ind	2	1740044
Etain (Sn)	mg/kg	5	50	300	300	<4		<4		1738849	<4		4	1740044
Manganèse (Mn)	mg/kg	-	-	-	-	560		530		1738849	470		2	1740044
Molybdène (Mo)	mg/kg	5	10	40	40	2	<Agr	1	<Agr	1738849	2	<Agr	1	1740044
Nickel (Ni)	mg/kg	50	50	50	50	19	<Agr	17	<Agr	1738849	15	<Agr	1	1740044
Plomb (Pb)	mg/kg	70	140	260	600	25	<Agr	50	<Agr	1738849	78	Agr-Res	5	1740044
Zinc (Zn)	mg/kg	200	200	200	200	93	<Agr	47	<Agr	1738849	46	<Agr	10	1740044
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable														

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**MÉTAUX EXTRACTIBLES TOTAUX (SOL)**

ID Maxxam						DS9683			DS9684			
Date d'échantillonnage						2017/03/09			2017/03/08			
# Bordereau						E-931429			E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-02 VRE-1 Dup. de Lab.</b>	<b>CR</b>	<b>Lot CQ</b>	<b>TR-03 VRE-1</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	15		N/A	16		N/A	N/A
<b>MÉTAUX</b>												
Argent (Ag)	mg/kg	20	20	40	40	<0.5		1738849	<0.5		0.5	1738875
Arsenic (As)	mg/kg	12	12	12	12	5	<Agr	1738849	<5		5	1738875
Baryum (Ba)	mg/kg	750	500	2000	2000	73	<Agr	1738849	78	<Agr	5	1738875
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		1738849	<0.5		0.5	1738875
Chrome (Cr)	mg/kg	64	64	87	87	14	<Agr	1738849	14	<Agr	2	1738875
Cobalt (Co)	mg/kg	40	50	300	300	5	<Agr	1738849	5	<Agr	2	1738875
Cuivre (Cu)	mg/kg	63	63	94	94	80 (1)	Res-Com	1738849	12	<Agr	2	1738875
Etain (Sn)	mg/kg	5	50	300	300	<4		1738849	6	Agr-Res	4	1738875
Manganèse (Mn)	mg/kg	-	-	-	-	470		1738849	430		2	1738875
Molybdène (Mo)	mg/kg	5	10	40	40	1	<Agr	1738849	1	<Agr	1	1738875
Nickel (Ni)	mg/kg	50	50	50	50	14	<Agr	1738849	15	<Agr	1	1738875
Plomb (Pb)	mg/kg	70	140	260	600	68 (1)	<Agr	1738849	120	Agr-Res	5	1738875
Zinc (Zn)	mg/kg	200	200	200	200	44	<Agr	1738849	47	<Agr	10	1738875
LDR = Limite de détection rapportée												
Lot CQ = Lot contrôle qualité												
Duplicata de laboratoire												
N/A = Non Applicable												
(1) La récupération ou l'écart relatif (RPD) pour ce composé est en dehors des limites de contrôle, mais l'ensemble du contrôle qualité rencontre les critères d'acceptabilité pour cette analyse												

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### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

ID Maxxam						DS9685		DS9686			
Date d'échantillonnage						2017/03/08		2017/03/08			
# Bordereau						E-931429		E-931429			
	<b>Unités</b>	<b>Agr</b>	<b>Res</b>	<b>Com</b>	<b>Ind</b>	<b>TR-04 VRE-1</b>	<b>CR</b>	<b>TR-05 VRE-3</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	-	12		15		N/A	N/A
<b>MÉTAUX</b>											
Argent (Ag)	mg/kg	20	20	40	40	<0.5		<0.5		0.5	1738875
Arsenic (As)	mg/kg	12	12	12	12	<5		5	<Agr	5	1738875
Baryum (Ba)	mg/kg	750	500	2000	2000	78	<Agr	80	<Agr	5	1738875
Cadmium (Cd)	mg/kg	1.4	10	22	22	<0.5		<0.5		0.5	1738875
Chrome (Cr)	mg/kg	64	64	87	87	22	<Agr	22	<Agr	2	1738875
Cobalt (Co)	mg/kg	40	50	300	300	7	<Agr	7	<Agr	2	1738875
Cuivre (Cu)	mg/kg	63	63	94	94	13	<Agr	20	<Agr	2	1738875
Etain (Sn)	mg/kg	5	50	300	300	<4		55	Res-Com	4	1738875
Manganèse (Mn)	mg/kg	-	-	-	-	450		690		2	1738875
Molybdène (Mo)	mg/kg	5	10	40	40	<1		2	<Agr	1	1738875
Nickel (Ni)	mg/kg	50	50	50	50	19	<Agr	22	<Agr	1	1738875
Plomb (Pb)	mg/kg	70	140	260	600	14	<Agr	62	<Agr	5	1738875
Zinc (Zn)	mg/kg	200	200	200	200	38	<Agr	56	<Agr	10	1738875
LDR = Limite de détection rapportée											
Lot CQ = Lot contrôle qualité											
N/A = Non Applicable											

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## REMARQUES GÉNÉRALES

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

État des échantillons à l'arrivée: BON

Version 2 - Les critères du CCME ont été ajoutés au rapport.

Agr,Res,Com,Ind,CR: Recommandations canadiennes pour la qualité des sols: environnement et santé humaine

Veuillez noter que nous présentons les critères se rapportant à un sol grossier.

Ces références ne sont rapportées qu'à titre indicatif et ne doivent être interprétées dans aucun autre contexte.

- = Ce composé ne fait pas partie de la réglementation.

### HAP PAR GCMS (SOL)

Veuillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

Les résultats bruts non-arrondis sont utilisés dans le calcul du benzo(b+j+k)fluoranthène. Ce résultat total est alors arrondi à deux chiffres significatifs.

### PHÉNOLS PAR GCMS (SOL)

Veuillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

### HYDROCARBURES PAR GCFID (SOL)

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).

Veuillez noter que les résultats n'ont pas été corrigés pour le blanc de méthode.

### COV PAR GC/MS (SOL)

Veuillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

Veuillez noter que les échantillons sont analysés par Headspace GC/MS.

Dû à la faible quantité d'échantillon, les limites de détection sont ajustées pour l'échantillon DS9683.

DS9687 : Les résultats sont basés sur un poids théorique de 5g sec.

### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

Veuillez noter que l'échantillon DS9683-01 n'est pas homogène, donc les résultats de tous les duplicatas sont présentés dans le tableau ci-dessus.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**

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### RAPPORT ASSURANCE QUALITÉ

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
1738834	MP		Blanc fortifié	1-Chlorooctadécane	2017/03/20		82	%	60 - 120
				Hydrocarbures pétroliers (C10-C50)	2017/03/20		93	%	70 - 130
1738834	MP		Blanc fortifié DUP	1-Chlorooctadécane	2017/03/20		76	%	60 - 120
				Hydrocarbures pétroliers (C10-C50)	2017/03/20		92	%	70 - 130
1738834	MP		RPD	Hydrocarbures pétroliers (C10-C50)	2017/03/20	0		%	50
				Hydrocarbures pétroliers (C10-C50)	2017/03/20	NC		%	50
				Hydrocarbures pétroliers (C10-C50)	2017/03/20	NC		%	50
1738834	MP		Blanc de méthode	1-Chlorooctadécane	2017/03/20		80	%	60 - 120
1738835	AK2		Blanc fortifié	Hydrocarbures pétroliers (C10-C50)	2017/03/20	<100		mg/kg	
				D10-Anthracène	2017/03/20		88	%	50 - 130
				D12-Benzo(a)pyrène	2017/03/20		98	%	50 - 130
				D14-Terphenyl	2017/03/20		90	%	50 - 130
				D8-Acenaphthylene	2017/03/20		86	%	50 - 130
				D8-Naphtalène	2017/03/20		88	%	50 - 130
				Acénaphène	2017/03/20		99	%	50 - 130
				Acénaphthylène	2017/03/20		97	%	50 - 130
				Anthracène	2017/03/20		101	%	50 - 130
				Benzo(a)anthracène	2017/03/20		97	%	50 - 130
				Benzo(a)pyrène	2017/03/20		91	%	50 - 130
				Benzo(b)fluoranthène	2017/03/20		102	%	50 - 130
				Benzo(j)fluoranthène	2017/03/20		99	%	50 - 130
				Benzo(k)fluoranthène	2017/03/20		91	%	50 - 130
				Benzo(b+j+k)fluoranthène	2017/03/20		97	%	50 - 130
				Benzo(c)phénanthrène	2017/03/20		101	%	50 - 130
				Benzo(ghi)pérylène	2017/03/20		97	%	50 - 130
				Chrysène	2017/03/20		99	%	50 - 130
				Dibenzo(a,h)anthracène	2017/03/20		98	%	50 - 130
				Dibenzo(a,i)pyrène	2017/03/20		86	%	50 - 130
				Dibenzo(a,h)pyrène	2017/03/20		99	%	50 - 130
				Dibenzo(a,l)pyrène	2017/03/20		93	%	50 - 130
				7,12-Diméthylbenzanthracène	2017/03/20		84	%	50 - 130
				Fluoranthène	2017/03/20		99	%	50 - 130
				Fluorène	2017/03/20		99	%	50 - 130
				Indéno(1,2,3-cd)pyrène	2017/03/20		97	%	50 - 130
				3-Méthylcholanthrène	2017/03/20		87	%	50 - 130
				Naphtalène	2017/03/20		98	%	50 - 130
				Phénanthrène	2017/03/20		97	%	50 - 130
				Pyrène	2017/03/20		97	%	50 - 130
				2-Méthylnaphtalène	2017/03/20		89	%	50 - 130
				1-Méthylnaphtalène	2017/03/20		88	%	50 - 130
				1,3-Diméthylnaphtalène	2017/03/20		92	%	50 - 130
2,3,5-Triméthylnaphtalène	2017/03/20		96	%	50 - 130				
1738835	AK2		Blanc de méthode	D10-Anthracène	2017/03/20		88	%	50 - 130
				D12-Benzo(a)pyrène	2017/03/20		92	%	50 - 130
				D14-Terphenyl	2017/03/20		90	%	50 - 130
				D8-Acenaphthylene	2017/03/20		86	%	50 - 130
				D8-Naphtalène	2017/03/20		88	%	50 - 130
				Acénaphène	2017/03/20	<0.1		mg/kg	
				Acénaphthylène	2017/03/20	<0.1		mg/kg	
Anthracène	2017/03/20	<0.1		mg/kg					

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**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
				Benzo(a)anthracène	2017/03/20	<0.1		mg/kg	
				Benzo(a)pyrène	2017/03/20	<0.1		mg/kg	
				Benzo(b)fluoranthène	2017/03/20	<0.1		mg/kg	
				Benzo(j)fluoranthène	2017/03/20	<0.1		mg/kg	
				Benzo(k)fluoranthène	2017/03/20	<0.1		mg/kg	
				Benzo(b+j+k)fluoranthène	2017/03/20	<0.1		mg/kg	
				Benzo(c)phénanthrène	2017/03/20	<0.1		mg/kg	
				Benzo(ghi)pérylène	2017/03/20	<0.1		mg/kg	
				Chrysène	2017/03/20	<0.1		mg/kg	
				Dibenzo(a,h)anthracène	2017/03/20	<0.1		mg/kg	
				Dibenzo(a,i)pyrène	2017/03/20	<0.1		mg/kg	
				Dibenzo(a,h)pyrène	2017/03/20	<0.1		mg/kg	
				Dibenzo(a,l)pyrène	2017/03/20	<0.1		mg/kg	
				7,12-Diméthylbenzanthracène	2017/03/20	<0.1		mg/kg	
				Fluoranthène	2017/03/20	<0.1		mg/kg	
				Fluorène	2017/03/20	<0.1		mg/kg	
				Indéno(1,2,3-cd)pyrène	2017/03/20	<0.1		mg/kg	
				3-Méthylcholanthrène	2017/03/20	<0.1		mg/kg	
				Naphtalène	2017/03/20	<0.1		mg/kg	
				Phénanthrène	2017/03/20	<0.1		mg/kg	
				Pyrène	2017/03/20	<0.1		mg/kg	
				2-Méthylnaphtalène	2017/03/20	<0.1		mg/kg	
				1-Méthylnaphtalène	2017/03/20	<0.1		mg/kg	
				1,3-Diméthylnaphtalène	2017/03/20	<0.1		mg/kg	
				2,3,5-Triméthylnaphtalène	2017/03/20	<0.1		mg/kg	
1738835		AK2	RPD	Acénaphène	2017/03/20	NC		%	50
				Acénaphthylène	2017/03/20	NC		%	50
				Anthracène	2017/03/20	NC		%	50
				Benzo(a)anthracène	2017/03/20	NC		%	50
				Benzo(a)pyrène	2017/03/20	NC		%	50
				Benzo(b)fluoranthène	2017/03/20	NC		%	50
				Benzo(j)fluoranthène	2017/03/20	NC		%	50
				Benzo(k)fluoranthène	2017/03/20	NC		%	50
				Benzo(c)phénanthrène	2017/03/20	NC		%	50
				Benzo(ghi)pérylène	2017/03/20	NC		%	50
				Chrysène	2017/03/20	NC		%	50
				Dibenzo(a,h)anthracène	2017/03/20	NC		%	50
				Dibenzo(a,i)pyrène	2017/03/20	NC		%	50
				Dibenzo(a,h)pyrène	2017/03/20	NC		%	50
				Dibenzo(a,l)pyrène	2017/03/20	NC		%	50
				7,12-Diméthylbenzanthracène	2017/03/20	NC		%	50
				Fluoranthène	2017/03/20	38		%	50
				Fluorène	2017/03/20	NC		%	50
				Indéno(1,2,3-cd)pyrène	2017/03/20	NC		%	50
				3-Méthylcholanthrène	2017/03/20	NC		%	50
				Naphtalène	2017/03/20	NC		%	50
				Phénanthrène	2017/03/20	NC		%	50
				Pyrène	2017/03/20	6.0		%	50
				2-Méthylnaphtalène	2017/03/20	NC		%	50
				1-Méthylnaphtalène	2017/03/20	NC		%	50

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### RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot								Limites
AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	CQ
			1,3-Diméthylnaphtalène	2017/03/20	NC		%	50
			2,3,5-Triméthylnaphtalène	2017/03/20	NC		%	50
			Acénaphène	2017/03/20	NC		%	50
			Acénaphthylène	2017/03/20	NC		%	50
			Anthracène	2017/03/20	NC		%	50
			Benzo(a)anthracène	2017/03/20	NC		%	50
			Benzo(a)pyrène	2017/03/20	NC		%	50
			Benzo(b)fluoranthène	2017/03/20	NC		%	50
			Benzo(j)fluoranthène	2017/03/20	NC		%	50
			Benzo(k)fluoranthène	2017/03/20	NC		%	50
			Benzo(b+j+k)fluoranthène	2017/03/20	NC		%	50
			Benzo(c)phénanthrène	2017/03/20	NC		%	50
			Benzo(ghi)pérylène	2017/03/20	NC		%	50
			Chrysène	2017/03/20	NC		%	50
			Dibenzo(a,h)anthracène	2017/03/20	NC		%	50
			Dibenzo(a,i)pyrène	2017/03/20	NC		%	50
			Dibenzo(a,h)pyrène	2017/03/20	NC		%	50
			Dibenzo(a,l)pyrène	2017/03/20	NC		%	50
			7,12-Diméthylbenzanthracène	2017/03/20	NC		%	50
			Fluoranthène	2017/03/20	NC		%	50
			Fluorène	2017/03/20	NC		%	50
			Indéno(1,2,3-cd)pyrène	2017/03/20	NC		%	50
			3-Méthylcholanthrène	2017/03/20	NC		%	50
			Naphtalène	2017/03/20	NC		%	50
			Phénanthrène	2017/03/20	NC		%	50
			Pyrène	2017/03/20	NC		%	50
			2-Méthylnaphtalène	2017/03/20	NC		%	50
			1-Méthylnaphtalène	2017/03/20	NC		%	50
			1,3-Diméthylnaphtalène	2017/03/20	NC		%	50
			2,3,5-Triméthylnaphtalène	2017/03/20	NC		%	50
1738849	KK	Blanc fortifié	Argent (Ag)	2017/03/21		94	%	75 - 125
			Arsenic (As)	2017/03/21		96	%	75 - 125
			Baryum (Ba)	2017/03/21		98	%	75 - 125
			Cadmium (Cd)	2017/03/21		96	%	75 - 125
			Chrome (Cr)	2017/03/21		98	%	75 - 125
			Cobalt (Co)	2017/03/21		99	%	75 - 125
			Cuivre (Cu)	2017/03/21		97	%	75 - 125
			Etain (Sn)	2017/03/21		101	%	75 - 125
			Manganèse (Mn)	2017/03/21		96	%	75 - 125
			Molybdène (Mo)	2017/03/21		97	%	75 - 125
			Nickel (Ni)	2017/03/21		98	%	75 - 125
			Plomb (Pb)	2017/03/21		101	%	75 - 125
			Zinc (Zn)	2017/03/21		96	%	75 - 125
1738849	KK	Blanc de méthode	Argent (Ag)	2017/03/21	<0.5		mg/kg	
			Arsenic (As)	2017/03/21	<5		mg/kg	
			Baryum (Ba)	2017/03/21	<5		mg/kg	
			Cadmium (Cd)	2017/03/21	<0.5		mg/kg	
			Chrome (Cr)	2017/03/21	<2		mg/kg	
			Cobalt (Co)	2017/03/21	<2		mg/kg	
			Cuivre (Cu)	2017/03/21	<2		mg/kg	

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Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot								Limites
AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	CQ
1738849	KK	RPD [DS9683-01]	Etain (Sn)	2017/03/21	<4		mg/kg	
			Manganèse (Mn)	2017/03/21	<2		mg/kg	
			Molybdène (Mo)	2017/03/21	<1		mg/kg	
			Nickel (Ni)	2017/03/21	<1		mg/kg	
			Plomb (Pb)	2017/03/21	<5		mg/kg	
			Zinc (Zn)	2017/03/21	<10		mg/kg	
			Aluminium (Al)	2017/03/21	17		%	30
			Antimoine (Sb)	2017/03/21	NC		%	30
			Argent (Ag)	2017/03/21	NC		%	30
			Arsenic (As)	2017/03/21	10		%	30
			Baryum (Ba)	2017/03/21	12		%	30
			Béryllium (Be)	2017/03/21	NC		%	30
			Bismuth (Bi)	2017/03/21	NC		%	30
			Bore (B)	2017/03/21	NC		%	30
			Cadmium (Cd)	2017/03/21	NC		%	30
			Calcium (Ca)	2017/03/21	16		%	30
			Chrome (Cr)	2017/03/21	13		%	30
			Cobalt (Co)	2017/03/21	17		%	30
			Cuivre (Cu)	2017/03/21	35 (1)		%	30
			Etain (Sn)	2017/03/21	NC		%	30
			Fer (Fe)	2017/03/21	9.3		%	30
			Lithium (Li)	2017/03/21	NC		%	30
			Magnésium (Mg)	2017/03/21	13		%	30
			Manganèse (Mn)	2017/03/21	13		%	30
			Mercuré (Hg)	2017/03/21	15		%	30
			Molybdène (Mo)	2017/03/21	14		%	30
			Nickel (Ni)	2017/03/21	16		%	30
			Phosphore total	2017/03/21	6.2		%	30
			Plomb (Pb)	2017/03/21	30		%	30
			Potassium (K)	2017/03/21	11		%	30
			Sodium (Na)	2017/03/21	3.7		%	30
			Strontium (Sr)	2017/03/21	9.4		%	30
			Tellure (Te)	2017/03/21	NC		%	30
Thallium (Tl)	2017/03/21	NC		%	30			
Thorium (Th)	2017/03/21	NC		%	N/A			
Titane (Ti)	2017/03/21	12		%	30			
Tungstène (W)	2017/03/21	NC		%	30			
Uranium (U)	2017/03/21	NC		%	30			
Vanadium (V)	2017/03/21	10		%	30			
Zinc (Zn)	2017/03/21	6.5		%	30			
Zirconium (Zr)	2017/03/21	NC		%	30			
1738864	TS2	Blanc fortifié	4-Bromofluorobenzène	2017/03/20		108	%	60 - 140
			D10-Ethylbenzène	2017/03/20		75	%	50 - 130
			D4-1,2-Dichloroéthane	2017/03/20		81	%	60 - 140
			D8-Toluène	2017/03/20		102	%	60 - 140
			Benzène	2017/03/20		98	%	60 - 140
			Chlorobenzène	2017/03/20		100	%	60 - 140
			Dichloro-1,2 benzène	2017/03/20		102	%	60 - 140
			Dichloro-1,3 benzène	2017/03/20		102	%	60 - 140
			Dichloro-1,4 benzène	2017/03/20		103	%	60 - 140

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GHD Consultants Ltée  
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Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites
									CQ
				Éthylbenzène	2017/03/20		90	%	60 - 140
				Styrène	2017/03/20		102	%	60 - 140
				Toluène	2017/03/20		90	%	60 - 140
				Xylènes (o,m,p)	2017/03/20		90	%	60 - 140
				Chloroforme	2017/03/20		78	%	60 - 140
				Chlorure de vinyle (chloroéthène)	2017/03/20		74	%	60 - 140
				Dichloro-1,1 éthane	2017/03/20		90	%	60 - 140
				Dichloro-1,2 éthane	2017/03/20		77	%	60 - 140
				Dichloro-1,1 éthène	2017/03/20		82	%	60 - 140
				Dichloro-1,2 éthène (cis)	2017/03/20		79	%	60 - 140
				Dichloro-1,2 éthène (trans)	2017/03/20		83	%	60 - 140
				Dichloro-1,2 éthène (cis et trans)	2017/03/20		81	%	60 - 140
				Dichlorométhane	2017/03/20		93	%	60 - 140
				Dichloro-1,2 propane	2017/03/20		100	%	60 - 140
				Dichloro-1,3 propène (cis)	2017/03/20		107	%	60 - 140
				Dichloro-1,3 propène (trans)	2017/03/20		94	%	60 - 140
				Dichloro-1,3 propène (cis et trans)	2017/03/20		101	%	60 - 140
				Tétrachloro-1,1,2,2 éthane	2017/03/20		96	%	60 - 140
				Tétrachloroéthène	2017/03/20		111	%	60 - 140
				Tétrachlorure de carbone	2017/03/20		83	%	60 - 140
				Trichloro-1,1,1 éthane	2017/03/20		77	%	60 - 140
				Trichloro-1,1,2 éthane	2017/03/20		93	%	60 - 140
				Trichloroéthène	2017/03/20		110	%	60 - 140
1738864		TS2	Blanc de méthode	4-Bromofluorobenzène	2017/03/20		102	%	60 - 140
				D10-Ethylbenzène	2017/03/20		80	%	50 - 130
				D4-1,2-Dichloroéthane	2017/03/20		83	%	60 - 140
				D8-Toluène	2017/03/20		105	%	60 - 140
				Benzène	2017/03/20	<0.1		mg/kg	
				Chlorobenzène	2017/03/20	<0.2		mg/kg	
				Dichloro-1,2 benzène	2017/03/20	<0.2		mg/kg	
				Dichloro-1,3 benzène	2017/03/20	<0.2		mg/kg	
				Dichloro-1,4 benzène	2017/03/20	<0.2		mg/kg	
				Éthylbenzène	2017/03/20	<0.2		mg/kg	
				Styrène	2017/03/20	<0.2		mg/kg	
				Toluène	2017/03/20	<0.2		mg/kg	
				Xylènes (o,m,p)	2017/03/20	<0.2		mg/kg	
				Chloroforme	2017/03/20	<0.2		mg/kg	
				Chlorure de vinyle (chloroéthène)	2017/03/20	<0.02		mg/kg	
				Dichloro-1,1 éthane	2017/03/20	<0.2		mg/kg	
				Dichloro-1,2 éthane	2017/03/20	<0.2		mg/kg	
				Dichloro-1,1 éthène	2017/03/20	<0.2		mg/kg	
				Dichloro-1,2 éthène (cis)	2017/03/20	<0.2		mg/kg	
				Dichloro-1,2 éthène (trans)	2017/03/20	<0.2		mg/kg	
				Dichloro-1,2 éthène (cis et trans)	2017/03/20	<0.2		mg/kg	
				Dichlorométhane	2017/03/20	<0.2		mg/kg	
				Dichloro-1,2 propane	2017/03/20	<0.2		mg/kg	
				Dichloro-1,3 propène (cis)	2017/03/20	<0.2		mg/kg	
				Dichloro-1,3 propène (trans)	2017/03/20	<0.2		mg/kg	
				Dichloro-1,3 propène (cis et trans)	2017/03/20	<0.2		mg/kg	
				Tétrachloro-1,1,2,2 éthane	2017/03/20	<0.2		mg/kg	

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**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
1738866	MA1	Blanc fortifié	Tétrachloroéthène	2017/03/20	<0.2			mg/kg	
			Tétrachlorure de carbone	2017/03/20	<0.1			mg/kg	
			Trichloro-1,1,1 éthane	2017/03/20	<0.2			mg/kg	
			Trichloro-1,1,2 éthane	2017/03/20	<0.2			mg/kg	
			Trichloroéthène	2017/03/20	<0.2			mg/kg	
			D6-Phénol	2017/03/21		98	%	60 - 130	
			Tribromophénol-2,4,6	2017/03/21		114	%	60 - 130	
			Trifluoro-m-crésol	2017/03/21		97	%	60 - 130	
			o-Crésol	2017/03/21		94	%	60 - 130	
			m-Crésol	2017/03/21		94	%	60 - 130	
			p-Crésol	2017/03/21		95	%	60 - 130	
			2,4-Diméthylphénol	2017/03/21		94	%	60 - 130	
			2-Nitrophénol	2017/03/21		89	%	60 - 130	
			4-Nitrophénol	2017/03/21		94	%	60 - 130	
			Phénol	2017/03/21		89	%	60 - 130	
			2-Chlorophénol	2017/03/21		90	%	60 - 130	
			3-Chlorophénol	2017/03/21		89	%	60 - 130	
			4-Chlorophénol	2017/03/21		90	%	60 - 130	
			2,3-Dichlorophénol	2017/03/21		95	%	60 - 130	
			2,4 + 2,5-Dichlorophénol	2017/03/21		92	%	60 - 130	
			2,6-Dichlorophénol	2017/03/21		93	%	60 - 130	
			3,4-Dichlorophénol	2017/03/21		89	%	60 - 130	
			3,5-Dichlorophénol	2017/03/21		94	%	60 - 130	
			Pentachlorophénol	2017/03/21		92	%	60 - 130	
			2,3,4,5-Tétrachlorophénol	2017/03/21		84	%	60 - 130	
			2,3,4,6-Tétrachlorophénol	2017/03/21		103	%	60 - 130	
			2,3,5,6-Tétrachlorophénol	2017/03/21		101	%	60 - 130	
2,3,4-Trichlorophénol	2017/03/21		90	%	60 - 130				
2,3,5-Trichlorophénol	2017/03/21		89	%	60 - 130				
2,3,6-Trichlorophénol	2017/03/21		107	%	60 - 130				
2,4,5-Trichlorophénol	2017/03/21		99	%	60 - 130				
2,4,6-Trichlorophénol	2017/03/21		95	%	60 - 130				
3,4,5-Trichlorophénol	2017/03/21		93	%	60 - 130				
1738866	MA1	Blanc de méthode	D6-Phénol	2017/03/21		96	%	60 - 130	
			Tribromophénol-2,4,6	2017/03/21		106	%	60 - 130	
			Trifluoro-m-crésol	2017/03/21		94	%	60 - 130	
			o-Crésol	2017/03/21	<0.1		mg/kg		
			m-Crésol	2017/03/21	<0.1		mg/kg		
			p-Crésol	2017/03/21	<0.1		mg/kg		
			2,4-Diméthylphénol	2017/03/21	<0.1		mg/kg		
			2-Nitrophénol	2017/03/21	<0.1		mg/kg		
			4-Nitrophénol	2017/03/21	<0.1		mg/kg		
			Phénol	2017/03/21	<0.1		mg/kg		
			2-Chlorophénol	2017/03/21	<0.1		mg/kg		
			3-Chlorophénol	2017/03/21	<0.1		mg/kg		
			4-Chlorophénol	2017/03/21	<0.1		mg/kg		
			2,3-Dichlorophénol	2017/03/21	<0.1		mg/kg		
			2,4 + 2,5-Dichlorophénol	2017/03/21	<0.1		mg/kg		
			2,6-Dichlorophénol	2017/03/21	<0.1		mg/kg		
			3,4-Dichlorophénol	2017/03/21	<0.1		mg/kg		

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Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot									Limites
AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	CQ	
1738866	MA1	RPD [DS9683-01]	3,5-Dichlorophénol	2017/03/21	<0.1		mg/kg		
			Pentachlorophénol	2017/03/21	<0.1		mg/kg		
			2,3,4,5-Tétrachlorophénol	2017/03/21	<0.1		mg/kg		
			2,3,4,6-Tétrachlorophénol	2017/03/21	<0.1		mg/kg		
			2,3,5,6-Tétrachlorophénol	2017/03/21	<0.1		mg/kg		
			2,3,4-Trichlorophénol	2017/03/21	<0.1		mg/kg		
			2,3,5-Trichlorophénol	2017/03/21	<0.1		mg/kg		
			2,3,6-Trichlorophénol	2017/03/21	<0.1		mg/kg		
			2,4,5-Trichlorophénol	2017/03/21	<0.1		mg/kg		
			2,4,6-Trichlorophénol	2017/03/21	<0.1		mg/kg		
			3,4,5-Trichlorophénol	2017/03/21	<0.1		mg/kg		
			o-Crésol	2017/03/21	NC		%		30
			m-Crésol	2017/03/21	NC		%		30
			p-Crésol	2017/03/21	NC		%		30
			2,4-Diméthylphénol	2017/03/21	NC		%		30
			2-Nitrophénol	2017/03/21	NC		%		30
			4-Nitrophénol	2017/03/21	NC		%		30
			Phénol	2017/03/21	NC		%		30
			2-Chlorophénol	2017/03/21	NC		%		30
			3-Chlorophénol	2017/03/21	NC		%		30
			4-Chlorophénol	2017/03/21	NC		%		30
			2,3-Dichlorophénol	2017/03/21	NC		%		30
			2,4 + 2,5-Dichlorophénol	2017/03/21	NC		%		30
			2,6-Dichlorophénol	2017/03/21	NC		%		30
			3,4-Dichlorophénol	2017/03/21	NC		%		30
			3,5-Dichlorophénol	2017/03/21	NC		%		30
			Pentachlorophénol	2017/03/21	NC		%		30
			2,3,4,5-Tétrachlorophénol	2017/03/21	NC		%		30
			2,3,4,6-Tétrachlorophénol	2017/03/21	NC		%		30
			2,3,5,6-Tétrachlorophénol	2017/03/21	NC		%		30
			2,3,4-Trichlorophénol	2017/03/21	NC		%		30
			2,3,5-Trichlorophénol	2017/03/21	NC		%		30
			2,3,6-Trichlorophénol	2017/03/21	NC		%		30
			2,4,5-Trichlorophénol	2017/03/21	NC		%		30
			2,4,6-Trichlorophénol	2017/03/21	NC		%		30
3,4,5-Trichlorophénol	2017/03/21	NC		%		30			
4-Chloro-3-méthylphénol	2017/03/21	NC		%		30			
2,4-Dinitrophénol	2017/03/21	NC		%		30			
2-Méthyl-4,6-dinitrophénol	2017/03/21	NC		%		30			
1738875	KK	Blanc fortifié	Argent (Ag)	2017/03/21		93	%	75 - 125	
			Arsenic (As)	2017/03/21		94	%	75 - 125	
			Baryum (Ba)	2017/03/21		96	%	75 - 125	
			Cadmium (Cd)	2017/03/21		95	%	75 - 125	
			Chrome (Cr)	2017/03/21		95	%	75 - 125	
			Cobalt (Co)	2017/03/21		97	%	75 - 125	
			Cuivre (Cu)	2017/03/21		96	%	75 - 125	
			Etain (Sn)	2017/03/21		99	%	75 - 125	
			Manganèse (Mn)	2017/03/21		94	%	75 - 125	
			Molybdène (Mo)	2017/03/21		95	%	75 - 125	
			Nickel (Ni)	2017/03/21		96	%	75 - 125	

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Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites	
									CQ	
1738875	KK	Blanc de méthode	Plomb (Pb)	2017/03/21			98	%	75 - 125	
			Zinc (Zn)	2017/03/21			95	%	75 - 125	
			Argent (Ag)	2017/03/21	<0.5				mg/kg	
			Arsenic (As)	2017/03/21	<5				mg/kg	
			Baryum (Ba)	2017/03/21	<5				mg/kg	
			Cadmium (Cd)	2017/03/21	<0.5				mg/kg	
			Chrome (Cr)	2017/03/21	<2				mg/kg	
			Cobalt (Co)	2017/03/21	<2				mg/kg	
			Cuivre (Cu)	2017/03/21	<2				mg/kg	
			Etain (Sn)	2017/03/21	<4				mg/kg	
			Manganèse (Mn)	2017/03/21	<2				mg/kg	
			Molybdène (Mo)	2017/03/21	<1				mg/kg	
			Nickel (Ni)	2017/03/21	<1				mg/kg	
			Plomb (Pb)	2017/03/21	<5				mg/kg	
			Zinc (Zn)	2017/03/21	<10				mg/kg	
1738887	CG2	Blanc fortifié	1-Chlorooctadécane	2017/03/21			97	%	60 - 120	
			Hydrocarbures pétroliers (C10-C50)	2017/03/21			97	%	70 - 130	
1738887	CG2	Blanc de méthode	1-Chlorooctadécane	2017/03/21			91	%	60 - 120	
			Hydrocarbures pétroliers (C10-C50)	2017/03/21	<100			mg/kg		
1738887	CG2	RPD	Hydrocarbures pétroliers (C10-C50)	2017/03/21	23			%	50	
1738887	CG2	RPD [DS9656-01]	Hydrocarbures pétroliers (C10-C50)	2017/03/21	NC			%	50	
1738887	CG2	RPD [DS9683-01]	Hydrocarbures pétroliers (C10-C50)	2017/03/21	NC			%	50	
1738888	AK2	Blanc fortifié	D10-Anthracène	2017/03/21			90	%	50 - 130	
			D12-Benzo(a)pyrène	2017/03/21			94	%	50 - 130	
			D14-Terphenyl	2017/03/21			74	%	50 - 130	
			D8-Acenaphthylene	2017/03/21			82	%	50 - 130	
			D8-Naphtalène	2017/03/21			82	%	50 - 130	
			Acénaphène	2017/03/21			98	%	50 - 130	
			Acénaphthylène	2017/03/21			89	%	50 - 130	
			Anthracène	2017/03/21			97	%	50 - 130	
			Benzo(a)anthracène	2017/03/21			92	%	50 - 130	
			Benzo(a)pyrène	2017/03/21			85	%	50 - 130	
			Benzo(b)fluoranthène	2017/03/21			96	%	50 - 130	
			Benzo(j)fluoranthène	2017/03/21			84	%	50 - 130	
			Benzo(k)fluoranthène	2017/03/21			89	%	50 - 130	
			Benzo(b+j+k)fluoranthène	2017/03/21			90	%	50 - 130	
			Benzo(c)phénanthrène	2017/03/21			83	%	50 - 130	
			Benzo(ghi)pérylène	2017/03/21			88	%	50 - 130	
			Chrysène	2017/03/21			90	%	50 - 130	
			Dibenzo(a,h)anthracène	2017/03/21			95	%	50 - 130	
			Dibenzo(a,i)pyrène	2017/03/21			92	%	50 - 130	
			Dibenzo(a,h)pyrène	2017/03/21			86	%	50 - 130	
			Dibenzo(a,l)pyrène	2017/03/21			88	%	50 - 130	
			7,12-Diméthylbenzanthracène	2017/03/21			78	%	50 - 130	
			Fluoranthène	2017/03/21			95	%	50 - 130	
			Fluorène	2017/03/21			96	%	50 - 130	
			Indéno(1,2,3-cd)pyrène	2017/03/21			96	%	50 - 130	
			3-Méthylcholanthrène	2017/03/21			83	%	50 - 130	
			Naphtalène	2017/03/21			92	%	50 - 130	
			Phénanthrène	2017/03/21			94	%	50 - 130	

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**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites
									CQ
1738888	AK2	Blanc de méthode	Pyrène	2017/03/21	91	%	50 - 130		
			2-Méthylnaphtalène	2017/03/21	92	%	50 - 130		
			1-Méthylnaphtalène	2017/03/21	89	%	50 - 130		
			1,3-Diméthylnaphtalène	2017/03/21	83	%	50 - 130		
			2,3,5-Triméthylnaphtalène	2017/03/21	91	%	50 - 130		
			D10-Anthracène	2017/03/21	82	%	50 - 130		
			D12-Benzo(a)pyrène	2017/03/21	84	%	50 - 130		
			D14-Terphenyl	2017/03/21	70	%	50 - 130		
			D8-Acenaphthylene	2017/03/21	76	%	50 - 130		
			D8-Naphtalène	2017/03/21	76	%	50 - 130		
			Acénaphthène	2017/03/21	<0.1	mg/kg			
			Acénaphthylène	2017/03/21	<0.1	mg/kg			
			Anthracène	2017/03/21	<0.1	mg/kg			
			Benzo(a)anthracène	2017/03/21	<0.1	mg/kg			
			Benzo(a)pyrène	2017/03/21	<0.1	mg/kg			
			Benzo(b)fluoranthène	2017/03/21	<0.1	mg/kg			
			Benzo(j)fluoranthène	2017/03/21	<0.1	mg/kg			
			Benzo(k)fluoranthène	2017/03/21	<0.1	mg/kg			
			Benzo(b+j+k)fluoranthène	2017/03/21	<0.1	mg/kg			
			Benzo(c)phénanthrène	2017/03/21	<0.1	mg/kg			
			Benzo(ghi)pérylène	2017/03/21	<0.1	mg/kg			
			Chrysène	2017/03/21	<0.1	mg/kg			
			Dibenzo(a,h)anthracène	2017/03/21	<0.1	mg/kg			
			Dibenzo(a,i)pyrène	2017/03/21	<0.1	mg/kg			
			Dibenzo(a,h)pyrène	2017/03/21	<0.1	mg/kg			
			Dibenzo(a,l)pyrène	2017/03/21	<0.1	mg/kg			
			7,12-Diméthylbenzanthracène	2017/03/21	<0.1	mg/kg			
			Fluoranthène	2017/03/21	<0.1	mg/kg			
			Fluorène	2017/03/21	<0.1	mg/kg			
			Indéno(1,2,3-cd)pyrène	2017/03/21	<0.1	mg/kg			
			3-Méthylcholanthrène	2017/03/21	<0.1	mg/kg			
			Naphtalène	2017/03/21	<0.1	mg/kg			
			Phénanthrène	2017/03/21	<0.1	mg/kg			
Pyrène	2017/03/21	<0.1	mg/kg						
2-Méthylnaphtalène	2017/03/21	<0.1	mg/kg						
1-Méthylnaphtalène	2017/03/21	<0.1	mg/kg						
1,3-Diméthylnaphtalène	2017/03/21	<0.1	mg/kg						
2,3,5-Triméthylnaphtalène	2017/03/21	<0.1	mg/kg						
1740044	OZP	Blanc fortifié	Argent (Ag)	2017/03/22	94	%	75 - 125		
			Arsenic (As)	2017/03/22	96	%	75 - 125		
			Baryum (Ba)	2017/03/22	99	%	75 - 125		
			Cadmium (Cd)	2017/03/22	97	%	75 - 125		
			Chrome (Cr)	2017/03/22	92	%	75 - 125		
			Cobalt (Co)	2017/03/22	94	%	75 - 125		
			Cuivre (Cu)	2017/03/22	94	%	75 - 125		
			Etain (Sn)	2017/03/22	103	%	75 - 125		
			Manganèse (Mn)	2017/03/22	93	%	75 - 125		
			Molybdène (Mo)	2017/03/22	98	%	75 - 125		
			Nickel (Ni)	2017/03/22	95	%	75 - 125		
			Plomb (Pb)	2017/03/22	102	%	75 - 125		

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
1740044	OZP		Blanc de méthode	Zinc (Zn)	2017/03/22		96	%	75 - 125
				Argent (Ag)	2017/03/22	<0.5		mg/kg	
				Arsenic (As)	2017/03/22	<5		mg/kg	
				Baryum (Ba)	2017/03/22	<5		mg/kg	
				Cadmium (Cd)	2017/03/22	<0.5		mg/kg	
				Chrome (Cr)	2017/03/22	<2		mg/kg	
				Cobalt (Co)	2017/03/22	<2		mg/kg	
				Cuivre (Cu)	2017/03/22	<2		mg/kg	
				Etain (Sn)	2017/03/22	<4		mg/kg	
				Manganèse (Mn)	2017/03/22	<2		mg/kg	
				Molybdène (Mo)	2017/03/22	<1		mg/kg	
				Nickel (Ni)	2017/03/22	<1		mg/kg	
				Plomb (Pb)	2017/03/22	<5		mg/kg	
				Zinc (Zn)	2017/03/22	<10		mg/kg	
1740044	OZP	RPD	Argent (Ag)	2017/03/22	NC		%	30	
			Arsenic (As)	2017/03/22	NC		%	30	
			Baryum (Ba)	2017/03/22	3.9		%	30	
			Cadmium (Cd)	2017/03/22	NC		%	30	
			Chrome (Cr)	2017/03/22	5.5		%	30	
			Cobalt (Co)	2017/03/22	3.8		%	30	
			Cuivre (Cu)	2017/03/22	15		%	30	
			Etain (Sn)	2017/03/22	NC		%	30	
			Manganèse (Mn)	2017/03/22	0.70		%	30	
			Molybdène (Mo)	2017/03/22	NC		%	30	
			Nickel (Ni)	2017/03/22	0.23		%	30	
			Plomb (Pb)	2017/03/22	2.7		%	30	
			Zinc (Zn)	2017/03/22	7.4		%	30	
			1740514	TS2	Blanc fortifié	4-Bromofluorobenzène	2017/03/23		103
D10-Ethylbenzène	2017/03/23					77	%	50 - 130	
D4-1,2-Dichloroéthane	2017/03/23					84	%	60 - 140	
D8-Toluène	2017/03/23					95	%	60 - 140	
Benzène	2017/03/23					98	%	60 - 140	
Chlorobenzène	2017/03/23					99	%	60 - 140	
Dichloro-1,2 benzène	2017/03/23					92	%	60 - 140	
Dichloro-1,3 benzène	2017/03/23					94	%	60 - 140	
Dichloro-1,4 benzène	2017/03/23					95	%	60 - 140	
Éthylbenzène	2017/03/23					88	%	60 - 140	
Styrène	2017/03/23					92	%	60 - 140	
Toluène	2017/03/23					82	%	60 - 140	
Xylènes (o,m,p)	2017/03/23					84	%	60 - 140	
Chloroforme	2017/03/23					79	%	60 - 140	
Chlorure de vinyle (chloroéthène)	2017/03/23					70	%	60 - 140	
Dichloro-1,1 éthane	2017/03/23					87	%	60 - 140	
Dichloro-1,2 éthane	2017/03/23					74	%	60 - 140	
Dichloro-1,1 éthène	2017/03/23					80	%	60 - 140	
Dichloro-1,2 éthène (cis)	2017/03/23					79	%	60 - 140	
Dichloro-1,2 éthène (trans)	2017/03/23					81	%	60 - 140	
Dichloro-1,2 éthène (cis et trans)	2017/03/23					80	%	60 - 140	
Dichlorométhane	2017/03/23					87	%	60 - 140	
Dichloro-1,2 propane	2017/03/23		84	%	60 - 140				

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot								Limites
AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	CQ
			Dichloro-1,3 propène (cis)	2017/03/23		92	%	60 - 140
			Dichloro-1,3 propène (trans)	2017/03/23		94	%	60 - 140
			Dichloro-1,3 propène (cis et trans)	2017/03/23		93	%	60 - 140
			Tétrachloro-1,1,2,2 éthane	2017/03/23		86	%	60 - 140
			Tétrachloroéthène	2017/03/23		106	%	60 - 140
			Tétrachlorure de carbone	2017/03/23		85	%	60 - 140
			Trichloro-1,1,1 éthane	2017/03/23		78	%	60 - 140
			Trichloro-1,1,2 éthane	2017/03/23		84	%	60 - 140
			Trichloroéthène	2017/03/23		100	%	60 - 140
1740514	TS2	Blanc de méthode	4-Bromofluorobenzène	2017/03/23		99	%	60 - 140
			D10-Ethylbenzène	2017/03/23		78	%	50 - 130
			D4-1,2-Dichloroéthane	2017/03/23		80	%	60 - 140
			D8-Toluène	2017/03/23		91	%	60 - 140
			Benzène	2017/03/23	<0.1		mg/kg	
			Chlorobenzène	2017/03/23	<0.2		mg/kg	
			Dichloro-1,2 benzène	2017/03/23	<0.2		mg/kg	
			Dichloro-1,3 benzène	2017/03/23	<0.2		mg/kg	
			Dichloro-1,4 benzène	2017/03/23	<0.2		mg/kg	
			Éthylbenzène	2017/03/23	<0.2		mg/kg	
			Styrène	2017/03/23	<0.2		mg/kg	
			Toluène	2017/03/23	<0.2		mg/kg	
			Xylènes (o,m,p)	2017/03/23	<0.2		mg/kg	
			Chloroforme	2017/03/23	<0.2		mg/kg	
			Chlorure de vinyle (chloroéthène)	2017/03/23	<0.02		mg/kg	
			Dichloro-1,1 éthane	2017/03/23	<0.2		mg/kg	
			Dichloro-1,2 éthane	2017/03/23	<0.2		mg/kg	
			Dichloro-1,1 éthène	2017/03/23	<0.2		mg/kg	
			Dichloro-1,2 éthène (cis)	2017/03/23	<0.2		mg/kg	
			Dichloro-1,2 éthène (trans)	2017/03/23	<0.2		mg/kg	
			Dichloro-1,2 éthène (cis et trans)	2017/03/23	<0.2		mg/kg	
			Dichlorométhane	2017/03/23	<0.2		mg/kg	
			Dichloro-1,2 propane	2017/03/23	<0.2		mg/kg	
			Dichloro-1,3 propène (cis)	2017/03/23	<0.2		mg/kg	
			Dichloro-1,3 propène (trans)	2017/03/23	<0.2		mg/kg	
			Dichloro-1,3 propène (cis et trans)	2017/03/23	<0.2		mg/kg	
			Tétrachloro-1,1,2,2 éthane	2017/03/23	<0.2		mg/kg	
			Tétrachloroéthène	2017/03/23	<0.2		mg/kg	
			Tétrachlorure de carbone	2017/03/23	<0.1		mg/kg	
			Trichloro-1,1,1 éthane	2017/03/23	<0.2		mg/kg	
			Trichloro-1,1,2 éthane	2017/03/23	<0.2		mg/kg	

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot								Limites
AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	CQ
			Trichloroéthène	2017/03/23	<0.2		mg/kg	
<p>N/A = Non Applicable</p> <p>Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.</p> <p>Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.</p> <p>Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.</p> <p>Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.</p> <p>NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue &lt;= 2x LDR)</p> <p>Réc = Récupération</p> <p>(1) La récupération ou l'écart relatif (RPD) pour ce composé est en dehors des limites de contrôle, mais l'ensemble du contrôle qualité rencontre les critères d'acceptabilité pour cette analyse</p>								

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

### PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Aomar Kaidi, B.Sc., Chimiste



Caroline Bougie, B.Sc. Chimiste



Maria Dragna Apopei, B.Sc., Chimiste



Michel Poulin, B.Sc., Chimiste



Ngoc-Thuy Do, B.Sc., Chimiste



Olga Zlatov Polevoi



Veronic Beausejour, B.Sc., Chimiste, Superviseur

Dossier Maxxam: B713923  
Date du rapport: 2017/04/20

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: TETRATECH  
Votre # de commande: 76206148  
Initiales du préleveur: FA

### **PAGE DES SIGNATURES DE VALIDATION (SUITE)**

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

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Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Votre # de commande: 76206148  
Votre # du projet: 11131157-A1  
Adresse du site: STE-ANNE-DE-BELLEVUE  
Votre # Bordereau: E929050

**Attention: Alexandre Fiorilli**

GHD Consultants Ltée  
MONTRÉAL  
4600 COTE VERTU  
SUITE 200  
VILLE ST-LAURENT, QC  
H4S 1C7

**Date du rapport: 2017/05/30**  
# Rapport: R2284657  
Version: 1 - Finale

**CERTIFICAT D'ANALYSES**

**# DE DOSSIER MAXXAM: B729221**

**Reçu: 2017/05/29, 15:00**

Matrice: SOL  
Nombre d'échantillons reçus: 2

Analyses	Quantité	Date de l'	Date	Méthode de laboratoire	Référence Primaire
		extraction	Analysé		
Hydrocarbures pétroliers (C10-C50)*	2	2017/05/29	2017/05/30	STL SOP-00172	MA.400-HYD. 1.1 R3 m
Métaux extractibles totaux par ICP*	2	2017/05/29	2017/05/29	STL SOP-00006	MA.200-Mét. 1.2 R5 m
Hydrocarbures aromatiques polycycliques*	2	2017/05/29	2017/05/29	STL SOP-00178	MA.400-HAP 1.1 R5 m

**Remarques:**

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.

Les résultats s'appliquent seulement aux échantillons analysés.

Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

\* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDELCC.

Votre # de commande: 76206148  
Votre # du projet: 11131157-A1  
Adresse du site: STE-ANNE-DE-BELLEVUE  
Votre # Bordereau: E929050

**Attention: Alexandre Fiorilli**

GHD Consultants Ltée  
MONTRÉAL  
4600 COTE VERTU  
SUITE 200  
VILLE ST-LAURENT, QC  
H4S 1C7

**Date du rapport: 2017/05/30**  
# Rapport: R2284657  
Version: 1 - Finale

**CERTIFICAT D'ANALYSES**

**# DE DOSSIER MAXXAM: B729221**

**Reçu: 2017/05/29, 15:00**

clé de cryptage

Veillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Rodrigo Caffarengo,

Courriel: RCaffarengo@maxxam.ca

Téléphone (514)448-9001 Ext:6336

=====

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B729221  
Date du rapport: 2017/05/30

GHD Consultants Ltée  
Votre # du projet: 11131157-A1  
Adresse du site: STE-ANNE-DE-BELLVUE  
Votre # de commande: 76206148  
Initiales du préleveur: FA

**HAP PAR GCMS (SOL)**

ID Maxxam					EA3222		EA3223			
Date d'échantillonnage					2017/03/08		2017/03/10			
# Bordereau					E929050		E929050			
	<b>Unités</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>DUP-1</b>	<b>CR</b>	<b>DUP-2</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	14		18		N/A	N/A
<b>HAP</b>										
Acénaphène	mg/kg	0.1	10	100	<0.10		<0.10		0.10	1782931
Acénaphylène	mg/kg	0.1	10	100	<0.10		<0.10		0.10	1782931
Anthracène	mg/kg	0.1	10	100	<0.10		<0.10		0.10	1782931
Benzo(a)anthracène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Benzo(a)pyrène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Benzo(b)fluoranthène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Benzo(j)fluoranthène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Benzo(k)fluoranthène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Benzo(b+j+k)fluoranthène	mg/kg	-	-	-	<0.10		<0.10		0.10	1782931
Benzo(c)phénanthrène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Benzo(ghi)pérylène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Chrysène	mg/kg	0.1	1	10	0.13	A-B	<0.10		0.10	1782931
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
7,12-Diméthylbenzanthracène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Fluoranthène	mg/kg	0.1	10	100	0.23	A-B	<0.10		0.10	1782931
Fluorène	mg/kg	0.1	10	100	<0.10		<0.10		0.10	1782931
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
3-Méthylcholanthrène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
Naphtalène	mg/kg	0.1	5	50	<0.10		<0.10		0.10	1782931
Phénanthrène	mg/kg	0.1	5	50	<0.10		<0.10		0.10	1782931
Pyrène	mg/kg	0.1	10	100	0.20	A-B	<0.10		0.10	1782931
2-Méthylnaphtalène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
1-Méthylnaphtalène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
1,3-Diméthylnaphtalène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
2,3,5-Triméthylnaphtalène	mg/kg	0.1	1	10	<0.10		<0.10		0.10	1782931
<b>Récupération des Surrogates (%)</b>										
D10-Anthracène	%	-	-	-	84		88		N/A	1782931
D12-Benzo(a)pyrène	%	-	-	-	80		80		N/A	1782931
D14-Terphenyl	%	-	-	-	80		84		N/A	1782931
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable										

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**HAP PAR GCMS (SOL)**

ID Maxxam					EA3222		EA3223			
Date d'échantillonnage					2017/03/08		2017/03/10			
# Bordereau					E929050		E929050			
	<b>Unités</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>DUP-1</b>	<b>CR</b>	<b>DUP-2</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
D8-Acenaphthylene	%	-	-	-	84		88		N/A	1782931
D8-Naphtalène	%	-	-	-	76		80		N/A	1782931
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable										

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**HYDROCARBURES PAR GCFID (SOL)**

ID Maxxam					EA3222		EA3222		EA3223			
Date d'échantillonnage					2017/03/08		2017/03/08		2017/03/10			
# Bordereau					E929050		E929050		E929050			
	<b>Unités</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>DUP-1</b>	<b>CR</b>	<b>DUP-1 Dup. de Lab.</b>	<b>CR</b>	<b>DUP-2</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	14		14		18		N/A	N/A
<b>HYDROCARBURES PÉTROLIERS</b>												
Hydrocarbures pétroliers (C10-C50)	mg/kg	300	700	3500	350	A-B	360	A-B	<100		100	1782930
<b>Récupération des Surrogates (%)</b>												
1-Chlorooctadécane	%	-	-	-	74		76		80		N/A	1782930
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité Duplicata de laboratoire N/A = Non Applicable												

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**MÉTAUX EXTRACTIBLES TOTAUX (SOL)**

ID Maxxam					EA3222		EA3223			
Date d'échantillonnage					2017/03/08		2017/03/10			
# Bordereau					E929050		E929050			
	<b>Unités</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>DUP-1</b>	<b>CR</b>	<b>DUP-2</b>	<b>CR</b>	<b>LDR</b>	<b>Lot CQ</b>
% HUMIDITÉ	%	-	-	-	14		18		N/A	N/A
<b>MÉTAUX</b>										
Argent (Ag)	mg/kg	2	20	40	<0.50		<0.50		0.50	1782815
Arsenic (As)	mg/kg	6	30	50	<5.0		<5.0		5.0	1782815
Baryum (Ba)	mg/kg	340	500	2000	77	<A	88	<A	5.0	1782815
Cadmium (Cd)	mg/kg	1.5	5	20	<0.50		<0.50		0.50	1782815
Chrome (Cr)	mg/kg	100	250	800	27	<A	17	<A	2.0	1782815
Cobalt (Co)	mg/kg	25	50	300	6.4	<A	6.0	<A	2.0	1782815
Cuivre (Cu)	mg/kg	50	100	500	26	<A	11	<A	2.0	1782815
Etain (Sn)	mg/kg	5	50	300	<4.0		12	A-B	4.0	1782815
Manganèse (Mn)	mg/kg	1000	1000	2200	370	<A	610	<A	2.0	1782815
Molybdène (Mo)	mg/kg	2	10	40	2.7	A-B	<1.0		1.0	1782815
Nickel (Ni)	mg/kg	50	100	500	20	<A	16	<A	1.0	1782815
Plomb (Pb)	mg/kg	50	500	1000	130	A-B	20	<A	5.0	1782815
Zinc (Zn)	mg/kg	140	500	1500	180	A-B	48	<A	10	1782815
LDR = Limite de détection rapportée										
Lot CQ = Lot contrôle qualité										
N/A = Non Applicable										

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## REMARQUES GÉNÉRALES

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

État des échantillons à l'arrivée:

Hydrocarbures pétroliers (C10-C50): Échantillon reçu congelé.: EA3222

Métaux extractibles totaux par ICP: Échantillon reçu congelé.: EA3222

Hydrocarbures aromatiques polycycliques: Échantillon reçu congelé.: EA3222

Hydrocarbures pétroliers (C10-C50): Échantillon reçu congelé.: EA3223

Métaux extractibles totaux par ICP: Échantillon reçu congelé.: EA3223

Hydrocarbures aromatiques polycycliques: Échantillon reçu congelé.: EA3223

A,B,C,CR: Les critères des sols proviennent de l'Annexe 2 du « Guide d'intervention-Protection des sols et réhabilitation des terrains contaminés. MDDELCC, 2016. » et intitulé « Grille des critères génériques pour les sols ». Pour les analyses de métaux (et métalloïdes) dans les sols, le critère A désigne la « Teneur de fond Secteur Basses-Terres du Saint-Laurent ».

Les critères A et B pour l'eau souterraine proviennent de l'annexe 7 intitulé « Grille des critères de qualité des eaux souterraines » du guide d'intervention mentionné plus haut. A=Eau de consommation; B=Résurgence dans l'eau de surface

Ces références ne sont rapportées qu'à titre indicatif et ne doivent être interprétées dans aucun autre contexte.

- = Ce composé ne fait pas partie de la réglementation.

### HAP PAR GCMS (SOL)

Veillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

Les résultats bruts non-arrondis sont utilisés dans le calcul du benzo(b+j+k)fluoranthène. Ce résultat total est alors arrondi à deux chiffres significatifs.

### HYDROCARBURES PAR GCFID (SOL)

Veillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).  
Veillez noter que les résultats n'ont pas été corrigés pour le blanc de méthode.

### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

Veillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**

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### RAPPORT ASSURANCE QUALITÉ

Lot	AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
1782815	OZP	Blanc fortifié	Argent (Ag)	2017/05/29	89	%	75 - 125		
			Arsenic (As)	2017/05/29	93	%	75 - 125		
			Baryum (Ba)	2017/05/29	97	%	75 - 125		
			Cadmium (Cd)	2017/05/29	93	%	75 - 125		
			Chrome (Cr)	2017/05/29	93	%	75 - 125		
			Cobalt (Co)	2017/05/29	95	%	75 - 125		
			Cuivre (Cu)	2017/05/29	92	%	75 - 125		
			Etain (Sn)	2017/05/29	97	%	75 - 125		
			Manganèse (Mn)	2017/05/29	91	%	75 - 125		
			Molybdène (Mo)	2017/05/29	93	%	75 - 125		
			Nickel (Ni)	2017/05/29	93	%	75 - 125		
			Plomb (Pb)	2017/05/29	93	%	75 - 125		
			Zinc (Zn)	2017/05/29	93	%	75 - 125		
1782815	OZP	Blanc de méthode	Argent (Ag)	2017/05/29	<0.50	mg/kg			
			Arsenic (As)	2017/05/29	<5.0	mg/kg			
			Baryum (Ba)	2017/05/29	<5.0	mg/kg			
			Cadmium (Cd)	2017/05/29	<0.50	mg/kg			
			Chrome (Cr)	2017/05/29	<2.0	mg/kg			
			Cobalt (Co)	2017/05/29	<2.0	mg/kg			
			Cuivre (Cu)	2017/05/29	<2.0	mg/kg			
			Etain (Sn)	2017/05/29	<4.0	mg/kg			
			Manganèse (Mn)	2017/05/29	<2.0	mg/kg			
			Molybdène (Mo)	2017/05/29	<1.0	mg/kg			
			Nickel (Ni)	2017/05/29	<1.0	mg/kg			
			Plomb (Pb)	2017/05/29	<5.0	mg/kg			
			Zinc (Zn)	2017/05/29	<10	mg/kg			
1782930	VA2	Blanc fortifié	1-Chlorooctadécane	2017/05/30		78	%	60 - 120	
			Hydrocarbures pétroliers (C10-C50)	2017/05/30		85	%	70 - 130	
1782930	VA2	Blanc de méthode	1-Chlorooctadécane	2017/05/30		80	%	60 - 120	
			Hydrocarbures pétroliers (C10-C50)	2017/05/30	<100	mg/kg			
1782930	VA2	RPD [EA3222-01]	Hydrocarbures pétroliers (C10-C50)	2017/05/30	4.3	%	50		
1782930	VA2	RPD	Hydrocarbures pétroliers (C10-C50)	2017/05/30	NC	%	50		
			Hydrocarbures pétroliers (C10-C50)	2017/05/30	4.2	%	50		
1782931	AK2	Blanc fortifié	D10-Anthracène	2017/05/29		86	%	50 - 130	
			D12-Benzo(a)pyrène	2017/05/29		82	%	50 - 130	
			D14-Terphenyl	2017/05/29		82	%	50 - 130	
			D8-Acenaphthylene	2017/05/29		86	%	50 - 130	
			D8-Naphtalène	2017/05/29		80	%	50 - 130	
			Acénaphène	2017/05/29		89	%	50 - 130	
			Acénaphthylène	2017/05/29		95	%	50 - 130	
			Anthracène	2017/05/29		95	%	50 - 130	
			Benzo(a)anthracène	2017/05/29		95	%	50 - 130	
			Benzo(a)pyrène	2017/05/29		86	%	50 - 130	
			Benzo(b)fluoranthène	2017/05/29		93	%	50 - 130	
			Benzo(j)fluoranthène	2017/05/29		89	%	50 - 130	
			Benzo(k)fluoranthène	2017/05/29		84	%	50 - 130	
			Benzo(b+j+k)fluoranthène	2017/05/29		88	%	50 - 130	
			Benzo(c)phénanthrène	2017/05/29		92	%	50 - 130	
			Benzo(ghi)pérylène	2017/05/29		90	%	50 - 130	
			Chrysène	2017/05/29		93	%	50 - 130	

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Initiales du préleveur: FA

**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot AQ/CQ	Init	Type CQ	Groupes	Date Analysé	Valeur	Réc	Unités	Limites CQ	
1782931	AK2	Blanc de méthode	Dibenzo(a,h)anthracène	2017/05/29		91	%	50 - 130	
			Dibenzo(a,i)pyrène	2017/05/29		90	%	50 - 130	
			Dibenzo(a,h)pyrène	2017/05/29		99	%	50 - 130	
			Dibenzo(a,l)pyrène	2017/05/29		95	%	50 - 130	
			7,12-Diméthylbenzanthracène	2017/05/29		87	%	50 - 130	
			Fluoranthène	2017/05/29		92	%	50 - 130	
			Fluorène	2017/05/29		93	%	50 - 130	
			Indéno(1,2,3-cd)pyrène	2017/05/29		100	%	50 - 130	
			3-Méthylcholanthrène	2017/05/29		82	%	50 - 130	
			Naphtalène	2017/05/29		90	%	50 - 130	
			Phénanthrène	2017/05/29		90	%	50 - 130	
			Pyrène	2017/05/29		91	%	50 - 130	
			2-Méthylnaphtalène	2017/05/29		91	%	50 - 130	
			1-Méthylnaphtalène	2017/05/29		85	%	50 - 130	
			1,3-Diméthylnaphtalène	2017/05/29		85	%	50 - 130	
			2,3,5-Triméthylnaphtalène	2017/05/29		90	%	50 - 130	
			D10-Anthracène	2017/05/29		88	%	50 - 130	
			D12-Benzo(a)pyrène	2017/05/29		82	%	50 - 130	
			D14-Terphenyl	2017/05/29		80	%	50 - 130	
			D8-Acenaphthylene	2017/05/29		86	%	50 - 130	
			D8-Naphtalène	2017/05/29		78	%	50 - 130	
			Acénaphène	2017/05/29		<0.10		mg/kg	
			Acénaphthylène	2017/05/29		<0.10		mg/kg	
			Anthracène	2017/05/29		<0.10		mg/kg	
			Benzo(a)anthracène	2017/05/29		<0.10		mg/kg	
			Benzo(a)pyrène	2017/05/29		<0.10		mg/kg	
			Benzo(b)fluoranthène	2017/05/29		<0.10		mg/kg	
			Benzo(j)fluoranthène	2017/05/29		<0.10		mg/kg	
			Benzo(k)fluoranthène	2017/05/29		<0.10		mg/kg	
			Benzo(b+j+k)fluoranthène	2017/05/29		<0.10		mg/kg	
			Benzo(c)phénanthrène	2017/05/29		<0.10		mg/kg	
			Benzo(ghi)pérylène	2017/05/29		<0.10		mg/kg	
			Chrysène	2017/05/29		<0.10		mg/kg	
Dibenzo(a,h)anthracène	2017/05/29		<0.10		mg/kg				
Dibenzo(a,i)pyrène	2017/05/29		<0.10		mg/kg				
Dibenzo(a,h)pyrène	2017/05/29		<0.10		mg/kg				
Dibenzo(a,l)pyrène	2017/05/29		<0.10		mg/kg				
7,12-Diméthylbenzanthracène	2017/05/29		<0.10		mg/kg				
Fluoranthène	2017/05/29		<0.10		mg/kg				
Fluorène	2017/05/29		<0.10		mg/kg				
Indéno(1,2,3-cd)pyrène	2017/05/29		<0.10		mg/kg				
3-Méthylcholanthrène	2017/05/29		<0.10		mg/kg				
Naphtalène	2017/05/29		<0.10		mg/kg				
Phénanthrène	2017/05/29		<0.10		mg/kg				
Pyrène	2017/05/29		<0.10		mg/kg				
2-Méthylnaphtalène	2017/05/29		<0.10		mg/kg				
1-Méthylnaphtalène	2017/05/29		<0.10		mg/kg				
1,3-Diméthylnaphtalène	2017/05/29		<0.10		mg/kg				
2,3,5-Triméthylnaphtalène	2017/05/29		<0.10		mg/kg				
1782931	AK2	RPD	Acénaphène	2017/05/29	NC		%	50	

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**RAPPORT ASSURANCE QUALITÉ (SUITE)**

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
			Acénaphtylène	2017/05/29	NC		%	50
			Anthracène	2017/05/29	NC		%	50
			Benzo(a)anthracène	2017/05/29	NC		%	50
			Benzo(a)pyrène	2017/05/29	NC		%	50
			Benzo(b)fluoranthène	2017/05/29	NC		%	50
			Benzo(j)fluoranthène	2017/05/29	NC		%	50
			Benzo(k)fluoranthène	2017/05/29	NC		%	50
			Benzo(c)phénanthrène	2017/05/29	NC		%	50
			Benzo(ghi)pérylène	2017/05/29	NC		%	50
			Chrysène	2017/05/29	NC		%	50
			Dibenzo(a,h)anthracène	2017/05/29	NC		%	50
			Dibenzo(a,i)pyrène	2017/05/29	NC		%	50
			Dibenzo(a,h)pyrène	2017/05/29	NC		%	50
			Dibenzo(a,l)pyrène	2017/05/29	NC		%	50
			7,12-Diméthylbenzanthracène	2017/05/29	NC		%	50
			Fluoranthène	2017/05/29	NC		%	50
			Fluorène	2017/05/29	NC		%	50
			Indéno(1,2,3-cd)pyrène	2017/05/29	NC		%	50
			3-Méthylcholanthrène	2017/05/29	NC		%	50
			Naphtalène	2017/05/29	NC		%	50
			Phénanthrène	2017/05/29	NC		%	50
			Pyrène	2017/05/29	NC		%	50
			2-Méthylnaphtalène	2017/05/29	NC		%	50
			1-Méthylnaphtalène	2017/05/29	NC		%	50
			1,3-Diméthylnaphtalène	2017/05/29	NC		%	50
			2,3,5-Triméthylnaphtalène	2017/05/29	NC		%	50
			Acénaphène	2017/05/29	0.43		%	50
			Acénaphtylène	2017/05/29	18 (1)		%	50
			Anthracène	2017/05/29	22		%	50
			Benzo(a)anthracène	2017/05/29	NC		%	50
			Benzo(a)pyrène	2017/05/29	NC		%	50
			Benzo(b)fluoranthène	2017/05/29	NC		%	50
			Benzo(j)fluoranthène	2017/05/29	NC		%	50
			Benzo(k)fluoranthène	2017/05/29	NC		%	50
			Benzo(b+j+k)fluoranthène	2017/05/29	NC		%	50
			Benzo(c)phénanthrène	2017/05/29	NC		%	50
			Benzo(ghi)pérylène	2017/05/29	NC		%	50
			Chrysène	2017/05/29	NC		%	50
			Dibenzo(a,h)anthracène	2017/05/29	NC		%	50
			Dibenzo(a,i)pyrène	2017/05/29	NC		%	50
			Dibenzo(a,h)pyrène	2017/05/29	NC		%	50
			Dibenzo(a,l)pyrène	2017/05/29	NC		%	50
			7,12-Diméthylbenzanthracène	2017/05/29	NC		%	50
			Fluoranthène	2017/05/29	NC		%	50
			Fluorène	2017/05/29	9.7		%	50
			Indéno(1,2,3-cd)pyrène	2017/05/29	NC		%	50
			3-Méthylcholanthrène	2017/05/29	NC		%	50
			Naphtalène	2017/05/29	3.1		%	50
			Phénanthrène	2017/05/29	5.4		%	50
			Pyrène	2017/05/29	NC		%	50

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### RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
			2-Méthylnaphtalène	2017/05/29	17		%	50
			1-Méthylnaphtalène	2017/05/29	7.2		%	50
			1,3-Diméthylnaphtalène	2017/05/29	12		%	50
			2,3,5-Triméthylnaphtalène	2017/05/29	8.2		%	50

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

(1) Dû à l'interférence de la matrice, la limite de détection a été augmentée.

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### PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



*Caroline Bougie*

Caroline Bougie, B.Sc. Chimiste



*Christian Guiang*

Christian Guiang, B.Sc., Chimiste



*Olga Zlatov*

Olga Zlatov Polevoi

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Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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