

Public Works and Government Services Canada  
Dredging and Service Area Construction  
Cripple Creek  
Shelburne County, N.S.  
Project No. R.076834.001

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1. Documents Required .1 Maintain at job site, one copy each of following:
- .1 Contract drawings
  - .2 Specifications
  - .3 Addenda
  - .4 Reviewed shop drawings/submissions
  - .5 Change orders
  - .6 Other modifications to Contract
  - .7 Field test reports
  - .8 Copy of approved work schedule
  - .9 Manufacturer's installation and application instructions
2. Site Conditions .1 Records of existing structures and geotechnical reports may be available for inspection at the offices of Public Works And Government Services Canada, 1713 Bedford Row, Halifax, N.S. This material is not necessarily up to date and is for information purposes only. It should be complemented by site visits and consultation with appropriate expertise.
3. Work Schedule And Completion Dates .1 Prepare and submit to the *Departmental Representative* within 5 days of notification of Contract award, one copy of the construction schedule in the form of a bar chart showing the dates for commencement and completion of each major activity of the work, including the work of subcontractors; dates for submissions, review and return of shop drawings, etc.; the dates of Substantial and Final Completion; and intended man hours of labour and equipment for each major item of work. If the schedule as submitted is unacceptable in any way, submit without delay a revised schedule satisfactory to the *Departmental Representative*.
- .2 The *Departmental Representative* is to notify the Contractor in writing of acceptance of the Construction Schedule. Comply with the Construction Schedule at all times. If, for any reason, the Construction Schedule is not followed, immediately notify the *Departmental Representative* of the change and
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- submit a revised schedule for acceptance. Upon written acceptance by the *Departmental Representative*, this schedule will become the Construction Schedule.
- .3 Whenever required, give further written particulars concerning this schedule. The submission to and acceptance by the *Departmental Representative* of the Contractor's Construction Schedule or the furnishing of details and particulars thereto will not relieve the Contractor of any duties and responsibilities under the Contract.
4. Measurement Responsibilities .1 Notify *Departmental Representative* sufficiently in advance of operations to permit required measurements for payment purposes.
5. Contractor's Use of Site
- .1 Co-operate with users of existing facilities.
- .2 Should interference's occur, take directions from *Departmental Representative*.
- .3 Do not unreasonably encumber site with materials or equipment.
- .4 Move stored products or equipment which interfere with operations of *Departmental Representative* or other Contractors.
- .5 Obtain and pay for use of additional storage or work areas needed for operations.
- .6 Comply with all regulations and authorities having jurisdiction over the work, whether on land or on water.
- .7 Ensure no damage occurs to existing structures as a result of operations. Any said damage will be repaired at Contractor's expense.
- .8 Provide temporary barriers and warning signs in location where work is adjacent to areas used by public.
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6. Codes and Standards
- .1 Perform work in accordance with National Building Code of Canada (NBC) and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements will apply.
  - .2 Meet or exceed requirements of specified standards, codes and referenced documents. When a standard or code is outdated, the latest edition will supersede the referenced date.
  - .3 Observe and enforce construction safety measures by Canadian Construction Safety Code and Construction Safety Code of Nova Scotia. In the event of conflict between any provisions of above authorities the most stringent provision will apply.
7. Project Meetings
- .1 *Departmental Representative* will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
8. Setting Out of Work
- .1 Do all detail surveys necessary for the work, including locating and maintaining working points, and establishing lines and elevations. Perform all layout work, and carefully preserve benchmarks, reference points and stakes.
  - .2 Provide such masts, scaffolds, batter boards, lines, straight edges, templates and other devices as may be necessary to facilitate layout, construction and inspection of the work. Whenever necessary, suspend work for such reasonable time as may be necessary to permit the *Departmental Representative* to check or inspect any portion of the Work. The Contractor will not be allowed any extra compensation or time for completion because of this suspension of work.
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- .3 Elevations for the various grades and features of the specified works to be referenced and properly related to a benchmark, which will be approved by the *Departmental Representative*.
- .4 Verify all grades, lines, levels, and dimensions shown on the drawings and report any errors or inconsistencies to the *Departmental Representative* before commencing work. Provide and maintain well built batterboards at all points to facilitate the progress of the work. Establish all other grades, lines, levels required to facilitate the work.
9. Existing Services
- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to pedestrian and vehicular traffic.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify *Departmental Representative* of findings.
- .3 Submit schedule to and obtain acceptance from *Departmental Representative* for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise *Departmental Representative* and confirm findings in writing.
10. Contract Documents
- .1 Contract Drawings:
- .1 The drawings for the Work consist of all drawings listed in these "Plans And Specifications" and any additional drawings issued at a later date by the *Departmental Representative*.
- .2 *Departmental Representative* may furnish additional drawings to assist in proper execution of work. These drawings will
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be issued for clarification only. Such drawings will have same meaning and intent as if they were included with plans referred to in Contract Documents.

.3 The drawings indicate the extent and general dimensions of the work. Make all necessary measurements to ensure that the result of the work is in accordance with the intent.

.4 Verify all existing conditions in field prior to proceeding with work.

.2 Contract Specifications:

.1 The general requirements and technical specifications are written solely for the General Contractor. They are organized into the NMS format of separate divisions and sections.

.2 Specification language is of the 'Short Form type' for example, where the word "provide" occurs, interpret it to mean "the Contractor shall furnish all labour, material and equipment necessary to complete the work".

.3 This Specification and accompanying drawings are intended to describe and provide for a finished project. They are intended to be complementary, and what is called for by either will be as binding as if called for by both. The Contractor shall understand that the work herein described will be complete in every detail, notwithstanding that every item necessarily involved is not particularly mentioned, and Contractor will be held to provide all labour, materials and equipment necessary for the entire completion of the work and will not avail himself of any errors or omissions.

11. Permits and Regulations

.1 Apply for, obtain and pay for all necessary permits, approvals and other authorizations required for the work.

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- .2 Comply with all by-laws, ordinances and regulations of all authorities having jurisdiction.
- .3 Pay for any Municipal permits, per General Conditions as stated in the contract.
12. Cutting, Fitting and Patching
- .1 Execute cutting (including excavation), fitting and patching required to make work fit properly.
- .2 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .3 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.
- .4 Obtain *Departmental Representative's* approval before cutting, boring or sleeving, or excavating adjacent to load-bearing members.
13. Record of Construction
- .1 As work progresses, maintain accurate records to show all deviations from the contract drawings, with particular reference to work which will be concealed. Prior to the inspection of the work for the issuance of the Final Certificate of Completion, provide the *Departmental Representative* with one set of white prints of the drawings with all deviations shown neatly thereon.
- .2 Provide "as built" cross sections of any excavation, dredging or fill work.
14. Payment
- .1 Payment for all work under this contract to be according to the Contract.
- .2 No separate payment will be made for work specified under any sections of Specification under Division 01. The cost of this work is to be considered as overhead and to be included in the lump sum of the Contract.
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- .3 Dimensional changes as directed by the *Departmental Representative* to suit existing conditions, but not resulting in additional work or materials, will not be considered as extra to the Contract.
15. Site Examination .1 All parties tendering should visit the site of the work prior to submission of tenders and make themselves thoroughly acquainted with site conditions, conditions of existing objects to be removed, tides, degree of exposure and all information necessary for the proper carrying out of the work covered by the drawings and this Specification. Submission of Tender will be deemed that Contractor is conversant with site conditions.
- .2 The *Departmental Representative* will give no consideration whatsoever to any claim by the Contractor resulting from failure to have made all the necessary investigations prior to tendering.
16. Maintenance of Shipping .1 Liaise with the local port officials to coordinate activities such that any interference is minimized.
17. Cooperation & Assistance to Departmental Representative .1 Co-operate with *Departmental Representative* on inspection of work.
- .2 Provide assistance when requested.
- .3 Provide small motor boat with operator and sounding chain for *Departmental Representative's* use when requested.
18. Datum .1 The datum referred to in this Specification is Chart Datum. Chart Datum is, by International Agreement a plane below which the tide will seldom fall. The Canadian Hydrographic Service has adopted the plane of the lowest normal tide (L.N.T.) as Chart Datum. As the rise, fall, and range of tides
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- varies daily, the Canadian Tide and Current Tables, as issued by the Canadian Hydrographic Service, should be consulted for tidal predictions and other tidal information relating to the work.
19. Contractor's Representative .1 Continuously maintain on the site an authorized representative to whom communication may be addressed and who will be competent to speak for the Contractor in discussing work methods.
20. Workers Compensation .1 Contractor and all sub-contractors must be registered under the Workers Compensation Act and provide evidence of good standing.
- .2 At completion of Contract and before final payment is made, the Contractor will present to the *Departmental Representative* a Letter of Certification from the Workers Compensation Board, showing that all required assessments are paid in connection with all trades.
21. Laws, Standards Taxes and Fees .1 Comply with all laws and standards governing all or any part of the work, pay all applicable taxes and pay for all permits and certificates required in respect of the execution of the work. Where variances exist between the requirements of agencies governing all or any part of the work, the most restrictive will govern, but in no instance will the standards established by the drawings and this Specification, which exceed such requirements, be reduced.
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22. Protection and Repair .1 Repair any damage resulting from operations under this contract.
23. Location of Equipment and Fixtures .1 Location of equipment, fixtures or any appurtenances indicated are to be considered approximate.
24. Inspection and Testing .1 The *Departmental Representative* may employ an Inspector and/or Testing Company to ensure work conforms with contract.
25. Disposal of Debris .1 Debris, including construction materials not incorporated in the work, oil products and containers, and other materials of this nature will be disposed of in suitable locations off the site. This includes costs of disposing of contaminated materials such as creosote treated timber. Disposal is the responsibility of the Contractor.
- .2 Material from the work will not be permitted to go adrift or otherwise become a menace to navigation.
26. Existing Soils Conditions .1 Any information pertaining to soils and all boreholes logs are furnished by the *Departmental Representative* as a matter of general information only and borehole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those described by the boreholes themselves.
27. Relics And Antiquities .1 Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.
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- .2 Give immediate notice to *Departmental Representative* and await written instructions before proceeding with work in this area.
- .3 Relics, antiquities and items of historical or scientific interest remain her Majesty's property.
28. Temporary Navigational Buoys
- .1 The Contractor is to maintain temporary buoy's to mark the position of the outer end of the work as construction proceeds. All buoy's are to meet the requirements of Canadian Coast Guard Standard TP968 and be equipped with radar reflectors.  
<http://www.ccg-qcc.gc.ca/folios/00020/docs/CanadianAidsNavigationSystem2011-eng.pdf>
- .2 The Contractor shall coordinate the buoy installation with the local harbour authority.
- .3 The Contractor is responsible for all costs associated with the supply, installation and removal of all temporary navigational buoy's.
30. Disposal of Dredged Material
- .1 Material will be disposed of on land owned by Small Craft Harbour property located in Cripple Creek and in Newellton, Shelburne County, NS as shown in Sheet 2 of 6 - Plan of New Work.
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PROJECT PARTICULARS

1. Description  
of Work

- .1 The work under this contract involves dredging and disposal of material at Cripple Creek Small Craft Harbour, Shelburne County, Nova Scotia.
- .2 The work includes but is not limited to:
  - .1 Dredging within the harbour basin and entrance channel to grades indicated or hard bottom, whichever is encountered first, as indicated on the plan and specifications.
  - .2 Transportation and disposal of the dredge material at designated landbased disposal site(s).
  - .3 For scheduling purposes, Contractors are to note the established work effort levels per fiscal year (the 12 month period ending March 31) are as follows;
    - 2015-16 - 10%
    - 2016-17 - 90% Dredging will not start before June 13th 2016. Work will be completed by August 31, 2016

PROJECT MEASUREMENT

1. General

- .1 This section details the measurement method to be used for payment purposes. Incidental items covered in the various sections of the Specification are to be allowed for in the pricing of each pay item.
  - .2 Unit and lump sum prices are full compensation for the work necessary to complete each item in the contract, in combination for all work necessary to complete the Work as a whole, and provided in accordance with the Construction Schedule and other plans indicated requiring submittal to and approval by the Departmental Representative.
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2. Measurement  
For Payment

**Lump Sum Items: The following items (1-3) are Measured separately for costing purposes, then combined and submitted as one item under the lump sum item in the tender documents.**

1. Departmental Representative's Site Office
2. Mobilization and Demobilization
3. Sitework

The contractor will be required to provide a break breakdown of lump sum costs upon award of the contract to permit evaluation of progress claims.

**Division 01**

Departmental Representative's Site Office:

All work associated with the supply, maintenance , and removal from site of the *Departmental Representative's* site office per Section 01 51 00 of the Specification will constitute a lump sum for measurement purposes.

**Division 31**

Sitework: Sitework will be measured by lump sum. This item will include all sitework and the toe in for the rip rap slope protection as outlined by **Section 31 11 00**.

**Division 35**

Mobilization and Demobilization will be measured for payment by lump sum. This item will include all costs for mobilization and demobilization.

**UNIT PRICE ITEMS: The following items outlines the unit of measurement for unit price items as indicated in the tender documents:**

**Division 32**

Granular Sub-Base: Supply and installation of Type 2 (Class "C") granular sub-base,

including compaction, will be measured for payment by the cubic meter.

### **Division 35**

Corestone: The supply and installation of corestone will be by the tonne.

Filterstone: The supply and installation of filterstone will be measure for payment by the tonne.

#### Dredging:

Dredging will be measured for payment by the cubic metre placee measurement (CMPM) of material removed above the specified dredge grades and within the specified side slopes as shown on the drawings. Dredge material to be placed within the containment berm to the elevation shown on the drawings and excess removed off site. This unit price will included the provision of a boat, motor and survey equipment as specified. The unit price will also include the cost of any requirements of Nova Scotia Department of the Environment and Labour for disposal of dredge spoils on land, and the supply, installation and removal of access roads. **Note: Previous dredging projects at this site have encountered boulders and very dense material during capital dredging below previous dredge limits.**

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1. General
    - .1 Submit to *Departmental Representative*, for review, shop drawings, product data, samples and other information specified.
    - .2 Until submission is reviewed, work involving relevant product may not proceed.
  2. Shop Drawings
    - .1 Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate Sections.
    - .2 Identify details by reference to sheet and detail numbers shown on Contract Drawings.
    - .3 Maximum sheet size 860 X 1120 mm.
    - .4 Reproductions for submissions: opaque diazo prints.
  3. Product Data
    - .1 Certain Specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings.
  4. Samples
    - .1 Submit samples in sizes and quantities specified.
    - .2 Construct field samples and mock-ups at locations acceptable to *Departmental Representative*.
    - .3 Accepted samples will become standards of workmanship and material against which, installed work will be checked on project.
  5. Miscellaneous Data
    - .1 Provide certificates, methodologies, designs and test results as required.
  6. Coordination of Submissions
    - .1 Review shop drawings, product data, samples and miscellaneous data prior to submission.
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- .2 Verify:
    - .1 Field Measurements.
    - .2 Field Construction Criteria.
    - .3 Catalogue numbers and similar data.
  - .3 Coordinate each submission with requirements of work and Contract documents. Individual submissions will not be reviewed until all related information is available.
  - .4 Contractor's responsibility for errors and omissions in submission is not relieved by *Departmental Representative's* review of submissions.
  - .5 Contractor's responsibility for deviations in submission from requirements in Contract documents is not relieved by *Departmental Representative's* review of submission, unless *Departmental Representative* gives written acceptance of specified deviations.
  - .6 Notify *Departmental Representative*, in writing at time of submission, of deviations from requirements of Contract documents stating reasons for deviations.
  - .7 After *Departmental Representative's* review, distribute copies.
7. Submission Requirements
- .1 Schedule submissions at least 14 days before dates reviewed submissions will be needed.
  - .2 Submit number of copies of shop drawings, product data which Contractor requires for distribution, plus 2 copies which will be retained by *Departmental Representative*.
  - .3 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 submitted.
    - .5 Other pertinent data.
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- .4 Submissions shall include:
    - .1 Date and revision dates.
    - .2 Project title and number.
    - .3 Name and address of:
      - .1 Contractor
      - .2 Sub-Contractor
      - .3 Supplier
      - .4 Manufacturer
      - .5 Separate detailer when pertinent
    - .4 Identification of product or material.
    - .5 Relation to adjacent structure or materials.
    - .6 Field dimensions, clearly identified as such.
    - .7 Specification Section Number.
    - .8 Applicable standards, such as CSA or CGSB numbers.
    - .9 Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract documents.
  
  - 8. Shop Drawings Review
    - .1 The review of shop drawings by Public Works and Government Services Canada or its authorized consultant is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that Public Works and Government Services Canada approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.
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9. Other Reviews .1 As for shop drawings above, other reviews are for the sole purpose of ascertaining conformance with the general concept.
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PART 1 - GENERAL

1.1 Related Work

- .1 Section 01 35 24: Special Procedures on Fire Safety Requirements.
- .2 Section 01 35 25: Special Procedures on Lockout Requirements

1.2 Definitions

- .1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2 Competent Person: means a person who is:
  - .1 Qualified by virtue of personal knowledge training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
  - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
  - .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.
- .3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 PPE: personal protective equipment.
- .5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.3 Submittals

- .1 Make submittals in accordance with Section 01 33 00.

- .2 Submit site-specific Health and Safety Plan prior to commencement of Work.
  - .1 Submit within 21 work days of notification of Bid Acceptance. Allow for 5-10 days for Department review and recommendations prior to the commencement of work. Provide [3] copies.
  - .2 Departmental Representative will review Health and Safety Plan and provide comments.
  - .3 Revise the Plan as appropriate and resubmit within [5][10] work days after receipt of comments.
  - .4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.
  - .5 Submit revisions and updates made to the Plan during the course of Work.
- .3 Submit name of designated Health and Safety Site Representative and support documentation specified in the Safety Plan.
- .4 Submit building permit, compliance certificates and other permits obtained.
- .5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other Department of Labour organization.
  - .1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.
- .6 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .7 Submit copies of incident reports.
- .8 Submit WHMIS MSDS - Material Safety Data Sheets.

1.4 Compliance Requirements

- .1 Comply with the Occupational Health and Safety Act for the Province of Nova Scotia, and the Regulations made pursuant to the Act.
- .2 Comply with Canada Labour Code - Part II (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations as well as any other regulations made pursuant to the Act.
  - .1 The Canada Labour Code can be viewed at: [laws-lois.justice.gc.ca/eng/acts/L-2\\_fulltext.html](http://laws-lois.justice.gc.ca/eng/acts/L-2_fulltext.html)
  - .2 Canadian Occupational Health and Safety Regulations can be viewed at: [Laws-lois.justice.gc.ca/eng/regulations/SOR-86-304/index.html](http://Laws-lois.justice.gc.ca/eng/regulations/SOR-86-304/index.html)
  - .3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: 819-956-4800 or 1-800-635-7943 Publication No. L31-85/2000 (E or F).
- .3 Treasury Board of Canada Secretariat (TBS):
  - .1 Treasury Board, Fire Protection Standard April 1, 2010  
[www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text](http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text)
- .4 Canadian Standards Association (CSA):
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .5 Observe construction safety measures of:
  - .1 NBC 2010, Division B, Part 8.
  - .2 Municipal by-laws and ordinances.
- .6 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.
- .7 Maintain Workers Compensation Coverage in good standing duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.

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- .8 Medical Surveillance: Where prescribed by legislation or regulation. Obtain and maintain worker medical surveillance documentation.
- 1.5 Responsibility
- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons and environment adjacent to the site to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by all workers, sub-contractors and other persons granted access to Work Site with safety requirements of Contract Documents, applicable federal, provincial, and local by-laws, regulations, and ordinances, and with site-specific Health and Safety Plan.
- 1.6 Site Control and Access
- .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.
- .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.
- .2 Isolate Work Site from other areas of the premises by use of appropriate means.
- .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular

traffic around and adjacent to the Work and create a safe environment.

- .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
- .3 Use professionally made signs with bilingual message in the 2 official languages or international known graphic symbols.

.3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.

.4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.

.5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm. [Provide security guard where adequate protection cannot be achieved by other means].

1.7 Protection

.1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work.

.2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.8 Filing of Notice

.1 File Notice of Project with pertinent provincial health and safety authorities prior to beginning of Work.

- .1 Departmental Representative will assist in locating address if needed.

1.9 Permits

- .1 Post permits, licenses and compliance certificates, specified in section [01 10 10], at Work Site.
- .2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.

1.10 Hazard Assessments

- .1 Perform site specific health and safety hazard assessment of the Work and its site.
- .2 Carryout initial assessment prior to commencement of Work with further assessments as needed during progress of work, [including when new trades and subcontractors arrive on site].
- .3 Record results and address in Health and Safety Plan.
- .4 Keep documentation on site for entire duration of the Work.

1.11 Project/Site Conditions

- .1 Following are potential health, environmental and safety hazards at the site for which Work may involve contact with:
  - .1 Existing hazardous and controlled products stored on site:
    - .1 [\_\_\_\_\_].
    - .2 [\_\_\_\_\_].
  - .2 Existing hazardous substances or contaminated [building] materials:
    - .1 [\_\_\_\_\_].
    - .2 [\_\_\_\_\_].
  - .3 Known latent site and environmental conditions:
    - .1 [\_\_\_\_\_].
    - .2 [\_\_\_\_\_].
  - .4 Facility on-going operations:
    - .1 [\_\_\_\_\_].

.2 [\_\_\_\_\_].

- .2 Above items shall not be construed as being complete and inclusive of potential health and safety hazards encountered during Work.
- .3 Include above items in the hazard assessment of the Work.
- .4 MSDS Data sheets of pertinent hazardous and controlled products stored on site can be obtained from Departmental Representative.

1.12 Meetings

- .1 Attend pre-construction health and safety meeting, convened and chaired by Departmental Representative, prior to commencement of Work, at time, date and location determined by Departmental Representative. Ensure attendance of:
  - .1 Superintendent of Work.
  - .2 Designated Health and Safety Site Representative
  - .3 Subcontractors
- .2 Conduct regularly scheduled tool box meetings during the Work in conformance with Occupational Health and Safety regulations.
- .3 Keep documents on site.

1.13 Health and Safety Plan

- .1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from the site.
- .2 Health and Safety Plan shall include the following components:
  - .1 List of health and safety risks and safety hazards identified by hazard assessment.

- .2 Control measures used to mitigate risks and hazards identified.
- .3 On-site Contingency and Emergency Response Plan as specified below.
- .4 On-site communications Plan as specified below.
- .5 Name of Contractor's designated Health and Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
- .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.
- .3 On-site Contingency and Emergency Response Plan shall include:
  - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
  - .2 Evacuation Plan: site and floor plan layouts showing escape routes, marshalling areas. Details on alarm notification methods, fire drills, location of fire fighting equipment and other related data.
  - .3 Name, duties and responsibilities of persons designated as Emergency Warden (s) and deputies.
  - .4 Emergency Contacts: name and telephone number of officials from:
    - .1 General Contractor and Subcontractors.
    - .2 Pertinent Federal and Provincial

- 
- Departments and Authorities having jurisdiction.
  - .3 Local emergency resource organizations.
  - .5 Harmonize Plan with Facility's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including the name of PWGSC and Facility Management contacts.
  - .4 On-site communications Plan:
    - .1 Procedures for sharing of work related Safety information to workers and subcontractors , including emergency and evacuation measures.
    - .2 List of critical work activities to be communicated with Facility Managers which have a risk of endangering health and safety of Facility users.
  - .5 Address all activities of the Work including those of subcontractors.
  - .6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade pr subcontractor arrive at Work site.
  - .7 Departmental Representative will response in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.
  - .8 Post copy of the Plan, and updates, prominently on Work Site

1.14 Safety  
Supervision

- .1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.
- .2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
  - .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work
  - .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
  - .3 Conduct site safety orientation session to persons granted access to Work Site.
  - .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
  - .5 Stop the Work as deemed necessary for reasons of health and safety.
- .3 Health & Safety Site Representative must:
  - .1 Be qualified and competent person in occupational health and safety.
  - .2 Have site-related working experience specific to activities of the Work.
  - .3 Be on Work Site at all times during execution of the Work.
- .4 All supervisory personnel assigned to the Work shall also be competent persons.
- .5 Inspections:
  - .1 Conduct regularly scheduled safety inspections of the Work on a minimum [bi-weekly] basis. Record deficiencies and remedial action taken.

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- 1.15 Training .1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.
- .2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.
- .3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- 1.16 Minimum Site Safety Rules .1 Notwithstanding requirement to abide by federal and provincial health and safety regulations; ensure the following minimum safety rules are obeyed by persons granted access to Work Site:
- .1 Wear appropriate PPE pertinent to the Work or assigned task; minimum being hard hat, safety footwear, safety glasses and hearing protection.
- .2 Immediately report unsafe condition at site, near-miss accident, injury and damage.
- .3 Maintain site and storage areas in a tidy condition free of hazards causing injury.
- .4 Obey warning signs and safety tags.
- .2 Brief persons of disciplinary protocols to be taken for noncompliance. [Post rules on site].
- 1.17 Correction for Non Compliance .1 Immediately address health and safety non-compliance issues identified by

authority having jurisdiction or by  
Departmental Representative.

- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

1.18 Incident Reporting

- .1 Investigate and report the following incidents to Departmental Representative:
  - .1 Incidents requiring notification to Provincial Department of Occupational Safety and Health, Workers Compensation Board or to other regulatory Agency.
  - .2 Medical aid injuries.
  - .3 Property damage in excess of \$10,000.00.
  - .4 Interruptions to Facility operations resulting in an operational lost to a Federal department in excess of \$5,000.00.
- .2 Submit report in writing.

1.19 Hazardous Products

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets for all products delivered to site
  - .1 Post on site.
  - .2 Submit copy to Departmental Representative
- .3 Post all MSDS data sheets on site, in a common area, visible to workers.

1.20 BLASTING

- .1 Blasting or other use of explosives is not permitted on site [without prior receipt of

written permission and instructions from Departmental Representative].

- 1.21 POWDER ACTUATED DEVICES .1 Abide by occupational health and safety regulations regarding work in confined spaces.
  
- 1.22 CONFINED SPACES .1 Maintain on site copy of safety documentation as specified in this section and other safety related reports and documents issued to or received from authorities having jurisdiction.  
  
.2 Make available to *Departmental Representative*, or authorized safety representative, for inspection upon request.
  
- 1.23 SITE RECORDS .1 Maintain on Work Site copy of safety related documentation and reports stipulated to be produced in compliance with Acts and Regulations of authorities having jurisdiction and of those documents specified herein.  
  
.2 Upon request, make available to Departmental Representative or authorized Safety Officer for inspection.
  
- 1.24 POSTING OF DOCUMENTS .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on Work Site in accordance with Acts and Regulations of Province having jurisdiction.  
  
.2 Post other documents as specified herein, Including:
  - .1 Site specific Health and Safety Plan.
  - .2 WHMIS data sheets.
  - .3 [\_\_\_\_\_].

PART 2 - PRODUCTS

- 2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used.

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1.1 References

- .1 Canada Shipping Act, Transport Canada, 2001, amended 2013-12-01
- .2 Canadian Coast Guard Regulations, Fisheries and Oceans Canada
- .3 Canadian Environmental Assessment Act, 2012, amended 2013-11-25
- .4 Canadian Environmental Protection Act, 1999, amended on 2014-03-28
- .5 Fisheries Act, 1985, Fisheries and Oceans Canada, amended 2013-11-25
- .6 Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters, 1998
- .7 Migratory Birds Convention Act, 1994, Environment Canada, amended 2010-12-10
- .8 Navigation Protection Act, 1985. Transport Canada, amended 2014-04-01
- .9 Nova Scotia - Environment Act
- .10 Species at Risk Act, 2002, amended 2013-03-08
- .11 The Federal Policy on Wetland Conservation, 1991, Environment Canada
- .12 Transportation of Dangerous Goods Act, 1992, Transport Canada, amended 2009-06-16
- .13 Workplace Hazardous Materials Information System, Health Canada.

1.2 Definitions

- .1 Archaeological resources: all tangible evidence of human activity that is of historical, cultural or scientific interest. Examples include features, structures, archaeological objects or remains at or from an archaeological site, or an object recorded as an isolated archaeological find.
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- .2 Buffer zone: a vegetated land that protects watercourses from adjacent land uses. It refers to the land adjacent to watercourses, such as streams, rivers, lakes, ponds, oceans, and wetlands, including the floodplain and the transitional lands between the watercourse and the drier upland areas.
  
  - .3 Deleterious substance: (a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or (b) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water.
  
  - .4 Fish habitat: spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes.
  
  - .5 Hazardous material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
  
  - .6 Invasive or alien species: refers to a species or subspecies introduced outside its normal distribution whose establishment and
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spread threaten ecosystems, habitats or species with economic or environmental harm.

- .7 Navigable water: a canal and any other body of water created or altered as a result of the construction of any work.
- .8 Surface watercourse: refers to the bed and shore of a river, stream, lake, creek, pond, marsh, estuary or salt-water body that contains water for at least part of each year.
- .9 Wetlands: land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or "peatlands," and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat.

1.3 Transportation

- .1 Transport hazardous materials and hazardous waste in compliance with the Transportation of Dangerous Goods Act.
  - .2 Eliminate free board spillage when excavating, loading and hauling dredged material.
  - .3 Trucks transporting dredged material will have watertight boxes.
  - .4 Do not overload trucks when hauling dredged material.
  - .5 Maintain trucks clean and free of mud, dirt and other foreign matter.
  - .6 Secure contents against spillage. Avoid potential release of contents and of any foreign matter onto highways, roads and access routes used for the work. Immediately clean any ground spills and soils to extent as directed by authority having jurisdiction.
-

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- .7 Prior to commencement of work, advise and seek approval from the *Departmental Representative* of the existing roads and temporary routes / roads (including the construction of any temporary causeways or access roads for the purposes of dredging) proposed to be used to access work areas and to haul material to and from the site, including roads to the dredge material disposal site.
  - .8 Construction material and debris is not to become waterborne.
  - .9 Any tools, equipment, vehicles, temporary structures or parts thereof used or maintained for the purpose of building or placing a work in navigable water are not to remain in place after the completion of the project.
  - .10 Vessels are to be permitted safe access through the worksite at all times, and assisted as necessary.
  - .11 Vessels should be compliant with all *Canada Shipping Act, 2001*, requirements for inspection, which includes certification of the vessel and adequate training and appropriate certificate of competency for the operators.
  - .12 All materials and equipment used in construction must be marked in accordance with the Collision Regulations of the *Canada Shipping Act, 2001* when located on the waterway.
  - .13 Advise the Canadian Coast Guard, Marine Communication and traffic Services (MCTS) at (902) 564-7751 or toll free at 1-800-686-8676 sufficiently in advance of commencement of work or when deploying or removing site markings in order to allow for appropriate Notices to Shipping/Mariners action.
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- .14 Work activities must comply with all / any conditions of the Navigation Protection Act (NPA) permit issued by Transport Canada.

1.4 Temporary Causeways  
and Access Roads

- .1 It will be the Contractor's responsibility to gain access to the dredge area. The construction and removal of temporary causeways and access roads will be at the Contractor's expense and will be removed immediately after clearance of the dredge area.
- .2 It will be the Contractor's responsibility to identify a location for the disposal of material imported by the Contractor for the construction of temporary causeways and access roads.
- .3 All material used for construction of temporary causeways and access roads must be clean and free from excessive fines, organics, debris and non-toxic (i.e., free of fuel, oil, grease and/or any other contaminants), non-ore bearing and from a provincially approved non-water source.
- .4 Material is to be screened, if required, to ensure that no fines or stones less than 0.2 kilograms are placed in the work. Gradation of the material to be imported for the construction of the causeways, roads etc. shall be within the following limits:

IMPERIAL SIZE	METRIC SIZE	PERCENT PASSING
18"	450 mm	100
8"	200 mm	44-75
4"	100 mm	24-50
2"	50 mm	7-14

- .5 Heavy machinery and equipment must be operated from a dry platform only. Temporary causeways and access roads shall be
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constructed at an elevation such that machinery and equipment is operating completely out of the water at all stages of the tide. If tidal work is being carried out, machinery and equipment shall be relocated back to a suitable elevation to prevent operating in submerged waters.

- .6 The Contractor is to maintain temporary buoys to mark the position of the access road including the outer toe as construction proceeds. All buoys are to meet requirements of the applicable Canadian Coast Guard standard and be equipped with radar reflectors.

1.5 Operation of Machinery

- .1 Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.
- .2 Whenever possible, operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the water body.
- .3 Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

.6 Disposal of Dredged Material

- .1 Material will be disposed of on land owned by Small Craft Harbour property located in Cripple Creek and in Newellton, Shelburne County, NS as shown in Sheet 2 of 6 - Plan of New Work.
  - .2 Water that decants from the disposed dredge spoil shall not enter any waterways.
  - .3 Site should allow for diffuse, dispersion or diversion onto a field or woodland, but not
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into drainage ditches that would carry water to a waterway.

- .4 The Marine Sediment Sampling Program report is included in Appendix [C].
- .5 Place and spread dredged material at the disposal site in a uniform and well graded manner. Minimize height and slopes of the disposed material. Match slopes and contours of the existing surrounding terrain as much as possible.
- .6 Items such as rubber tires, bottles, cans and other debris or litter must be removed from the disposal site following regrading. Failure to remove such debris may constitute a littering offence under applicable regulations.
- .7 Control runoff of water containing suspended materials or other harmful substances in accordance with requirements of all federal, provincial and municipal authorities having jurisdiction.
- .8 Obtain approval from *Departmental Representative* of the proposed route to be used to haul dredged material to the disposal site.

1.7 Containment and Spill Management

- . 1 Comply with Federal (CEPA *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*) and Provincial regulations, codes, standards and guidelines for the storage of fuel and allied petroleum products on site.
  - .2 Do not dump petroleum products or any other deleterious substances on ground or in the water.
  - .3 Be diligent and take all necessary precautions to avoid spills and contaminate
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the soil and water (both surface and subsurface) when handling petroleum products on site and during fueling and servicing of vehicles and equipment.

- .4 Maintain on site appropriate emergency spill response equipment consisting of at least one 250-litre (55 gallon) overpack spill kit for containment and cleanup of spills.
- .5 Maintain vehicles and equipment in good working order to prevent leaks on site.
- .6 In the event of a petroleum spill, immediately notify the *Departmental Representative* and the Canadian Coast Guard (CCG) at 1-800-565-1633 (24 hour report line). Perform clean-up in accordance with all regulations and procedures stipulated by authority having jurisdiction.
- .7 Materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals are not to enter the watercourse.
- .8 Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance.
- .9 Ensure that all vessels will have procedures in place to ensure safeguards against marine pollution: awareness training of all employees, means of retention of waste oil on board and discharge to shore based reception facilities, capacity of responding to and clean-up of accidental spill caused by vessels involved in any particular project.

## 1.8 Hazardous

Material Handling

- .1 Store and handle hazardous materials in accordance with applicable federal and provincial regulations, codes, standards and
-

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- guidelines. Store in location that will prevent spillage into the environment.
- .2 Label containers to WHMIS requirements and keep MSDS data sheets on site for all hazardous materials.
  - .3 Maintain inventory of hazardous materials and hazardous waste stored on site. List items by product name, quantity and date when stored.
  - .4 Store and handle flammable and combustible materials in accordance with National Fire Code.
- 1.9 Disposal of Wastes
- .1 Do not bury rubbish, construction and demolition debris (i.e., concrete, creosote timbers, steel, impacted soil materials etc.) and waste materials on site.
  - .2 Dispose and recycle construction and demolition debris and waste materials in accordance with Provincial Waste Management Regulations and the project waste management requirements specified in section 02 41 23 - Demolition and Removals.
  - .3 Do not dispose of hazardous waste, volatile materials (such as mineral spirits, paints, thinners etc.) and petroleum products into waterways, storm or sanitary sewers or in waste landfill sites.
  - .4 Dispose of hazardous waste in accordance with applicable federal and provincial, regulations, codes, standards and guidelines.
- 1.10 Water Quality
- .1 Conduct dredging of a watercourse in such a manner to limit turbidity and reduce sediment suspension in the water to an absolute minimum at all times.
    - .1 Maintain appropriate production speed and momentum of the excavation equipment. Make adjustments as required
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and as approved by *Departmental Representative*.

.2 Strategically position excavator equipment and haul vehicles to avoid over the water swings of dredged material whenever possible.

.3 Restrict the amount of material dredged to the area and depth required for navigation.

.4 Avoid bottom stockpiling, dragging or side casting material during dredging. If these activities are being proposed, the Contractor must:

a) employ suitable operational and engineering controls (e.g., silt curtain), as approved by the *Departmental Representative*, around the dredge work area, or

b) hire a qualified professional to develop a Water Quality Monitoring (WQM) program for the site. The Contractor will not be permitted to start any in-water work or dredging until the WQM program is approved by the *Departmental Representative*. The WQM program will require direct-read turbidity measurements from a data-logger as well as collection of water samples for Total Suspended Solids (TSS) for off-site analysis in a certified laboratory. The WQM program will include a suitable number of fixed collection points from which data shall be collected prior to any dredging operations to establish background levels of turbidity and TSS. A collection point must also be established for the collection of data within 30 meters of the dredge while the dredge is operating. If the turbidity and TSS results at any of the collection points exceed the CCME

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Water Quality Guidelines for the Protection of Aquatic Life, the Contractor shall cease dredging operations immediately and a DFO Fisheries Protection Program (FPP) Biologist must be contacted at 902-401-0897 to determine what adaptive measures shall be employed including additional operational and engineering controls (e.g. silt curtains).

- .2 Where work may affect the water quality adjacent to water intake lines used by lobster holding facilities, fish processing facilities and other harbour users, schedule work in cooperation with the Harbour Authority as directed by *Departmental Representative* to minimize interference and impact to harbour users.
  - .3 Do not wash down equipment within a 30 metre buffer zone of a wetland, watercourse or other identified environmentally sensitive area.
  - .4 Where required, install effective sediment control measures before starting work to prevent the entry or re-suspension of sediment in the water body. Inspect sediment control measures regularly to ensure they are functioning properly, and make all necessary repairs if any damage occurs. Upon completion of use, remove these control measures in a way that prevents the escape of settled sediment.
  - .5 Develop and implement an Erosion and Sediment Control Plan for the site that minimizes risk of sedimentation of the water body during all phases of the work. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the water body or settling
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basin and runoff water is clear. The plan should, where applicable, include:

- a) Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body.
  - b) Measures for managing water flowing onto the site, as well as water being pumped / diverted from the site such that sediment is filtered out prior to the water entering a water body. For example, pumping / diversion of water to a vegetated area, construction of a settling basin or other filtration system.
  - c) Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., dredging, underwater cable installation).
  - d) Measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby water bodies to prevent re-entry.
  - e) Regular inspection and maintenance of erosion and sediment control measures and structures during the course of the work.
  - f) Repairs to erosion and sediment control measures and structures if damage occurs.
  - g) Removal of non-biodegradable erosion and sediment control materials once site is stabilized.
  - h) Description of approach for managing potential impacts to the local environment including silt curtains, sediment fence, hay bales, treatment, etc.
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1.11 Blasting

- .1 Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.
  - .2 If explosives are required as part of a project (e.g., removal of structures such as piers, pilings, footings; removal of obstructions such as beaver dams; or preparation of a river or lake bottom for installation of a structure such as a dam or water intake), the potential for impacts to fish and fish habitat should be minimized by implementing the following measures:
    - .1 Time in-water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate Fisheries & Oceans Canada timing windows.
    - .2 Isolate the work site to exclude fish from within the blast area by using bubble / air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aquadams.
    - .3 Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting.
    - .4 Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e., decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations.
    - .5 Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed / water interface to confine the blast.
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- .6 Place blasting mats over top of holes to minimize scattering of blast debris around the area.
  - .7 Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products.
  - .8 Remove all blasting debris and other associated equipment / products from the blast area.

1.12 Socioeconomic  
Restrictions

- .1 Abide by municipal and provincial regulations for any restrictions on work performed during the night time and on flood lighting of the site. Obtain applicable permits.
- .2 Place flood lights in opposite direction of adjacent residential and business areas.
- .3 Work equipment and machinery must be equipped with purposely designed mufflers to reduce noise on site to lowest possible level. Maintain mufflers in good operating condition at all times.

1.13 Bird and Bird  
Habitat

- .1 Become knowledgeable with and abide by the Migratory Birds Convention Act (MBCA) in regards to the protection of migratory birds, their eggs, nests and their young encountered on site and in the vicinity.
  - .2 Minimize disturbance to all birds on site and adjacent areas during the entire course of the Work.
  - .3 Do not approach concentrations of seabirds, waterfowl and shorebirds when anchoring equipment, accessing wharves or ferrying supplies.
  - .4 During night time work, shield flood lights, point them downwards and position them in opposite direction of nearby bird nesting habitat.
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- .5 No staging of vehicles or equipment/material storage will take place on any beaches or dunes.
  - .6 Should nests of migratory birds in wetlands be encountered during work, immediately notify *Departmental Representative* for directives to be followed.
    - .1 Do not disturb nest site and neighbouring vegetation until nesting is completed.
    - .2 Minimize work immediately adjacent to such areas until nesting is completed.
    - .3 Protect these areas by following recommendations of Canadian Wildlife Service.
  - .7 Equipment must be equipped with standard, maintained noise suppression devices to minimize disturbance to birds.

1.14 Fish Protection

- .1 Avoid wet, windy and rainy periods that may increase erosion and sedimentation.
  - .2 Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.
  - .3 Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.
  - .4 Be aware of the risk for contamination of the fish habitat at the site as a result of alien species being introduced in the water.
  - .5 To minimize the possibility of fish habitat contamination and the spread of aquatic
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invasive (alien species), all construction equipment which will be immersed into the water of a watercourse, or has the possibility of coming into contact with such water during the course of the work, must be cleaned and washed to ensure that they are free of marine growth and alien species.

- .1 Equipment shall include boats, barges, cranes, excavators, haul trucks, pumps, pipe lines and all other miscellaneous tools and equipment previously used in a marine environment.
  - .6 Cleaning and washing of equipment shall be performed immediately upon their arrival at the site and before use in or over the body of water.
  - .7 Conduct cleaning and washing operations as follows:
    - .1 Scrape and remove heavy accumulation of mud and dispose appropriately.
    - .2 Wash all surfaces of equipment by use of a pressurized fresh water supply.
    - .3 Immediately follow with application of a heavy sprayed coating of undiluted vinegar or other environmentally approved cleaning agent to thoroughly remove all plant matter, animals and sediments.
    - .4 Check and remove all plant, animal and sediment matter from the all bilges and filters.
    - .5 Drain standing water from equipment and let fully dry before use.
    - .6 Upon removal from the water, drain standing water from equipment and let fully dry before removal off the site.
  - .8 Do not perform cleaning and washdown within a 30 metre buffer zone of a wetland, watercourse or other identified environmentally sensitive area.
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- .9 Record of Assurance Logbook:
- .1 Maintain an on-going log of past and present usage and washdowns of all equipment to illustrate mitigation measures undertaken against fish habitat contamination by alien species.
  - .2 Write data in a hard cover bound logbook to include the following:
    - .1 Date and location where equipment was previously used in a watercourse or wetland;
    - .2 Type of work performed.
    - .3 Dates of wash down for each piece of equipment;
    - .4 Cleaning method and cleaning agent(s) used.
  - .10 Keep Record of Assurance Logbook updated from project to project. Upon request, submit logbook to *Departmental Representative* for review.
  - .11 Abide by requirements and recommendations from Fisheries and Oceans Canada - Fisheries Protection Program in cleaning and wash down of equipment.
  - .12 Work activities must comply with all / any conditions of the Fisheries Act Authorization issued by Fisheries and Oceans Canada. A copy of the Fisheries Act Authorization must be kept on site at all times.
  - .13 To protect fish, fish adjacent to the harbour, suspended sediment levels shall not exceed 25 milligrams per litre (mg/l) or 8 nephelometric turbidity units (NTUs) above background at 100 m from the nearest infill site over a 24 hour period. Background levels shall be measured at least 500 m from the project site in a non-disturbed area and upstream from any sediment movement. An independent consultant will be collecting samples to document concentrations of these parameters. The Contractor shall cease
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**Service Area Construction and Dredging****Cripple Creek SCH****Cripple Creek, Nova Scotia****Project No. R.076834.002**Environmental Protection Procedures  
for Marine Work

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operations immediately and a DFO Fisheries Protection Program (FPP) Biologist must be contacted at 902-402-0298 to determine what adaptive measures shall be employed including additional operational and engineering controls (e.g. silt curtains).

1.15 Air Quality

- .1 Keep airborne dust and dirt resulting from the work on site to an absolute minimum.
- .2 Dust suppression by the application of water must be employed, when required. Apply dust control measures to roads, parking lots and work areas. The *Departmental Representative* shall determine locations where water is to be applied, the amount of water to be applied, and the times at which it shall be applied. Waste oil must not to be used for dust control under any circumstances.
- .3 Spray surfaces with water or other environmentally approved product. Use purposely suited equipment or machinery and apply in sufficient quantity and frequency to provide effective result and continued dust control during the entire course of the work.
- .4 Do not use oil or any other petroleum products for dust control.

1.16 Fires

- .1 Fires and burning of rubbish on site is not permitted.

1.17 Archaeological

- .1 All construction personnel are responsible for reporting any unusual materials unearthed during construction to the construction supervisor. If the find is believed to be an archaeological resource, the construction supervisor will immediately stop work in the vicinity of the find and notify his / her immediate supervisor.
  - .2 If an archaeological and / or historically significant item is discovered during dredging or excavation, work in the area will be stopped immediately and the *Departmental*
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*Representative* will be contacted as well as the provincial Archaeological Services unit:

a) Nova Scotia - NS Department of Communities, Culture and Heritage, Special Places Program - Nova Scotia Museum telephone: (902) 424-6461

.3 Work can only resume in the vicinity of the find when authorized by the PWGSC Project Manager and Construction Supervisor, after approval has been granted by the Nova Scotia Department of Communities, Culture and Heritage.

.4 In the event of the discovery of human remains or evidence of burials, the excavation work will immediately cease and nearest law enforcement agency will be contacted immediately by the PWGSC Project Manager and/or the Construction Supervisor.

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1. Access
    - .1 Provide and maintain adequate access to project site.
    - .2 If authorized to use existing roads or structures for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.
    - .3 The contractor is to maintain full access to the work site. Should a court injunction be required ordering a person or group to refrain from impeding access to the site, such as a demonstration, picketing or union action, then obtaining the injunction and any associated costs will be considered incidental to this contract. Any delays associated with such activity will be considered incidental to this contract.
  2. Contractor's Site Office
    - .1 Establish on the site of the work and keep open at all times during the execution of the work an office where all letters, orders, notices and other communications may be received or acknowledged either by the Contractor or his authorized agent or representative. Provide a telephone in the office.
    - .2 Keep one up-to-date copy of contract documents, bulletins and other materials as specified under **Section 01 10 10**.
  3. Departmental Representative's Site Office
    - .1 Provide temporary office for sole use of *Departmental Representative*, complete with heat and lights. Insulated office required during October to May. Locate on or adjacent to site.
    - .2 Inside dimensions minimum 5 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.
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- .3 Arrange and pay for telephone and fax machine installation and service in *Departmental Representative's* office for the *Departmental Representative's* exclusive use. Long distance calls placed on this phone by the *Departmental Representative* will be paid for by *Departmental Representative*.
- .4 Washroom facilities not required in the office. Provide outside sanitary facilities to approval.
- .5 Equip office with six chairs, flat 1200 X 2400 X 25 table with writing surface and 4 drawer lockable filing cabinet.
- .6 Maintain in clean condition.
4. Storage Sheds
- .1 Provide adequate weather tight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.
- .2 Contractor to make his own arrangements for on-site storage areas.
5. Sanitary Facilities
- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
6. Parking
- .1 Contractor to make own arrangements to provide parking space for work force.
7. Power
- .1 Arrange, pay for and maintain temporary electrical power supply in accordance with governing regulations and ordinances.
- .2 Install temporary facilities for power such as pole lines and cables to approval of local power supply authority.
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| 8.  | <u>Water Supply</u>                    | .1 | Arrange, pay for and maintain temporary water supply in accordance with governing regulations and ordinances.  |
| 9.  | <u>Barricades</u>                      | .1 | Provide and maintain sufficient barricades, fencing, notices, warning signs, light signals, etc. for the protection of adjoining property and to warn others and workmen engaged on the job of the dangers caused by the work. |
|     |  | .2 | Types and location of barricades, etc. to be in accordance with local regulations and to the satisfaction of <i>Departmental Representative</i> .  |
|     |  | .3 | The presence of such barricades, lights, etc. shall not relieve the Contractor of the responsibility for any damages.  |
| 10. | <u>Security</u>                        | .1 | Contractor to make his own arrangements for security of his equipment, materials, damages resulting from fire and theft.   |
| 11. | <u>Site Signs and Notices</u>          | .1 | Only Project Identification and Consultant/ Contractor signboards and notices for safety or instruction are permitted on site.   |
|     |  | .2 | Format, location and quantity of site signs and notices to be accepted by <i>Departmental Representative</i> .   |
|     |  | .3 | Signs and notices for safety or instruction to be in English and French languages, or commonly understood graphic symbols.   |
| 12. | <u>Removal of Temporary Facilities</u> | .1 | Remove temporary facilities from site when directed by <i>Departmental Representative</i> .  |
|     |  | .2 | When project is closed down for a period of time, keep temporary facilities operational until no longer required by <i>Departmental Representative</i> .   |
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1. General
    - .1 Use new material and equipment unless otherwise specified.
    - .2 Submit following information for any or all materials and products proposed for supply within 7 days of request by *Departmental Representative*:
      - .1 name and address of manufacturer
      - .2 trade name, model and catalogue number
      - .3 performance, descriptive and test data
      - .4 manufacturer's installation or application instructions
      - .5 evidence of arrangements to procure.
    - .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
    - .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
  2. Manufacturers Instructions
    - .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
    - .2 Notify *Departmental Representative* in writing of any conflict between these specifications and manufacturers instructions. *Departmental Representative* will designate which document is to be followed.
  3. Fastenings-General
    - .1 All fastenings are to be the sizes indicated on the contract plans and are to be hot dipped galvanized to CSA-G164 Latest Edition unless otherwise noted.
  4. Delivery and Storage
    - .1 Deliver, store and maintain packaged material and equipment with manufacturer's seal and labels intact.
    - .2 Prevent damage, adulteration and soiling of material and equipment during delivery,
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- handling and storage. Immediately remove rejected material and equipment from site.
- .3 Store material and equipment in accordance with supplier's instructions.
5. Conformance .1 When material or equipment is specified by standard or performance specifications, upon request of *Departmental Representative*, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.
6. Substitution .1 Proposals for substitution may be submitted only after award of Contract. Such requests must include statements of respective costs of items originally specified and proposed substitutions.
- .2 Proposals will be considered by *Departmental Representative* if:
- .1 Products selected by tenderer from those specified, are not available, or
- .2 Delivery date of products from those specified would unduly delay completion of Contract, or
- .3 Alternative products to those specified, which are brought to attention of, and considered by *Departmental Representative* as equivalent to those specified and will result in a credit to Contract amount.
- .3 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on project. Pay for design or drawing changes required as result of substitution.
- .4 Amounts of all credits arising from approval of substitutions will be determined by *Departmental Representative* and Contract price will be reduced accordingly. No substitutions will be permitted without prior
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- written approval of *Departmental Representative*.
- .5 Departmental Representative reserves the right for acceptance or rejection of substitution of materials.
7. Construction  
Equipment and Plant .1 On request, prove to the satisfaction of *Departmental Representative* that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
- .2 Maintain construction equipment and plant in good operating order.
8. Damaged and  
Rejected Materials .1 Immediately replace, repair or otherwise make good any material damaged, broken or defaced during construction to the satisfaction of *Departmental Representative*.
- .2 Remove rejected materials from site.
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1. Record Drawings
    - .1 *Departmental Representative* will provide two sets of white prints for record drawing purposes.
    - .2 Maintain project record drawings and accurately record deviations from contract documents caused by site conditions and changes ordered by *Departmental Representative*.
    - .3 Mark changes in red coloured ink.
    - .4 Record following information:
      - .1 Elevations of various elements in relation to Chart Datum.
      - .2 Field changes in dimensions and details.
      - .3 Changes made by Change Order.
    - .5 At completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to *Departmental Representative*.
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1. General
    - .1 Conduct cleaning and disposal operations to comply with ordinances and antipollution laws.
    - .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
    - .3 Prevent accumulation of waste which create hazardous conditions.
  2. Cleaning During Construction
    - .1 Maintain the work, at least on a daily basis free from accumulations of waste material and debris.
    - .2 Provide on-site containers for collection of waste materials, and debris.
    - .3 Remove waste materials, and debris from site.
    - .4 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet concrete or newly painted surfaces.
  3. Final Cleaning
    - .1 In preparation for acceptance of the project on an interim or final certificate of completion perform final cleaning.
    - .2 Remove grease, dust, dirt, stains, and other foreign materials from finished surfaces.
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- .3 Elevations for the various grades and features of the specified works to be referenced and properly related to a benchmark, which will be approved by the *Departmental Representative*.
- .4 Verify all grades, lines, levels, and dimensions shown on the drawings and report any errors or inconsistencies to the *Departmental Representative* before commencing work. Provide and maintain well built batterboards at all points to facilitate the progress of the work. Establish all other grades, lines, levels required to facilitate the work.
9. Existing Services
- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to pedestrian and vehicular traffic.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify *Departmental Representative* of findings.
- .3 Submit schedule to and obtain acceptance from *Departmental Representative* for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise *Departmental Representative* and confirm findings in writing.
10. Contract Documents
- .1 Contract Drawings:
- .1 The drawings for the Work consist of all drawings listed in these "Plans And Specifications" and any additional drawings issued at a later date by the *Departmental Representative*.
- .2 *Departmental Representative* may furnish additional drawings to assist in proper execution of work. These drawings will
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be issued for clarification only. Such drawings will have same meaning and intent as if they were included with plans referred to in Contract Documents.

.3 The drawings indicate the extent and general dimensions of the work. Make all necessary measurements to ensure that the result of the work is in accordance with the intent.

.4 Verify all existing conditions in field prior to proceeding with work.

.2 Contract Specifications:

.1 The general requirements and technical specifications are written solely for the General Contractor. They are organized into the NMS format of separate divisions and sections.

.2 Specification language is of the 'Short Form type' for example, where the word "provide" occurs, interpret it to mean "the Contractor shall furnish all labour, material and equipment necessary to complete the work".

.3 This Specification and accompanying drawings are intended to describe and provide for a finished project. They are intended to be complementary, and what is called for by either will be as binding as if called for by both. The Contractor shall understand that the work herein described will be complete in every detail, notwithstanding that every item necessarily involved is not particularly mentioned, and Contractor will be held to provide all labour, materials and equipment necessary for the entire completion of the work and will not avail himself of any errors or omissions.

11. Permits and Regulations

.1 Apply for, obtain and pay for all necessary permits, approvals and other authorizations required for the work.

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- .2 Comply with all by-laws, ordinances and regulations of all authorities having jurisdiction.
- .3 Pay for any Municipal permits, per General Conditions as stated in the contract.
12. Cutting, Fitting and Patching
- .1 Execute cutting (including excavation), fitting and patching required to make work fit properly.
- .2 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .3 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.
- .4 Obtain *Departmental Representative's* approval before cutting, boring or sleeving, or excavating adjacent to load-bearing members.
13. Record of Construction
- .1 As work progresses, maintain accurate records to show all deviations from the contract drawings, with particular reference to work which will be concealed. Prior to the inspection of the work for the issuance of the Final Certificate of Completion, provide the *Departmental Representative* with one set of white prints of the drawings with all deviations shown neatly thereon.
- .2 Provide "as built" cross sections of any excavation, dredging or fill work.
14. Payment
- .1 Payment for all work under this contract to be according to the Contract.
- .2 No separate payment will be made for work specified under any sections of Specification under Division 01. The cost of this work is to be considered as overhead and to be included in the lump sum of the Contract.
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- .3 Dimensional changes as directed by the *Departmental Representative* to suit existing conditions, but not resulting in additional work or materials, will not be considered as extra to the Contract.
15. Site Examination .1 All parties tendering should visit the site of the work prior to submission of tenders and make themselves thoroughly acquainted with site conditions, conditions of existing objects to be removed, tides, degree of exposure and all information necessary for the proper carrying out of the work covered by the drawings and this Specification. Submission of Tender will be deemed that Contractor is conversant with site conditions.
- .2 The *Departmental Representative* will give no consideration whatsoever to any claim by the Contractor resulting from failure to have made all the necessary investigations prior to tendering.
16. Maintenance of Shipping .1 Liaise with the local port officials to coordinate activities such that any interference is minimized.
17. Cooperation & Assistance to Departmental Representative .1 Co-operate with *Departmental Representative* on inspection of work.
- .2 Provide assistance when requested.
- .3 Provide small motor boat with operator and sounding chain for *Departmental Representative's* use when requested.
18. Datum .1 The datum referred to in this Specification is Chart Datum. Chart Datum is, by International Agreement a plane below which the tide will seldom fall. The Canadian Hydrographic Service has adopted the plane of the lowest normal tide (L.N.T.) as Chart Datum. As the rise, fall, and range of tides
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- varies daily, the Canadian Tide and Current Tables, as issued by the Canadian Hydrographic Service, should be consulted for tidal predictions and other tidal information relating to the work.
19. Contractor's Representative .1 Continuously maintain on the site an authorized representative to whom communication may be addressed and who will be competent to speak for the Contractor in discussing work methods.
20. Workers Compensation .1 Contractor and all sub-contractors must be registered under the Workers Compensation Act and provide evidence of good standing.
- .2 At completion of Contract and before final payment is made, the Contractor will present to the *Departmental Representative* a Letter of Certification from the Workers Compensation Board, showing that all required assessments are paid in connection with all trades.
21. Laws, Standards Taxes and Fees .1 Comply with all laws and standards governing all or any part of the work, pay all applicable taxes and pay for all permits and certificates required in respect of the execution of the work. Where variances exist between the requirements of agencies governing all or any part of the work, the most restrictive will govern, but in no instance will the standards established by the drawings and this Specification, which exceed such requirements, be reduced.
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| 22. | <u>Protection and Repair</u>              | .1 | Repair any damage resulting from operations under this contract.   |
| 23. | <u>Location of Equipment and Fixtures</u> | .1 | Location of equipment, fixtures or any appurtenances indicated are to be considered approximate.   |
| 24. | <u>Inspection and Testing</u>             | .1 | The <i>Departmental Representative</i> may employ an Inspector and/or Testing Company to ensure work conforms with contract.   |
| 25. | <u>Disposal of Debris</u>                 | .1 | Debris, including construction materials not incorporated in the work, oil products and containers, and other materials of this nature will be disposed of in suitable locations off the site. This includes costs of disposing of contaminated materials such as creosote treated timber. Disposal is the responsibility of the Contractor. |
|     |   | .2 | Material from the work will not be permitted to go adrift or otherwise become a menace to navigation.  |
| 26. | <u>Existing Soils Conditions</u>          | .1 | Any information pertaining to soils and all boreholes logs are furnished by the <i>Departmental Representative</i> as a matter of general information only and borehole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those described by the boreholes themselves.                     |
| 27. | <u>Relics And Antiquities</u>             | .1 | Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.  |
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- .2 Give immediate notice to *Departmental Representative* and await written instructions before proceeding with work in this area.
- .3 Relics, antiquities and items of historical or scientific interest remain her Majesty's property.
28. Temporary Navigational Buoys
- .1 The Contractor is to maintain temporary buoy's to mark the position of the outer end of the work as construction proceeds. All buoy's are to meet the requirements of Canadian Coast Guard Standard TP968 and be equipped with radar reflectors.  
<http://www.ccg-qcc.gc.ca/folios/00020/docs/CanadianAidsNavigationSystem2011-eng.pdf>
- .2 The Contractor shall coordinate the buoy installation with the local harbour authority.
- .3 The Contractor is responsible for all costs associated with the supply, installation and removal of all temporary navigational buoy's.
30. Disposal of Dredged Material
- .1 Material will be disposed of on land owned by Small Craft Harbour property located in Cripple Creek and in Newellton, Shelburne County, NS as shown in Sheet 2 of 6 - Plan of New Work.
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PROJECT PARTICULARS

1. Description  
of Work

- .1 The work under this contract involves dredging and disposal of material at Cripple Creek Small Craft Harbour, Shelburne County, Nova Scotia.
- .2 The work includes but is not limited to:
  - .1 Dredging within the harbour basin and entrance channel to grades indicated or hard bottom, whichever is encountered first, as indicated on the plan and specifications.
  - .2 Transportation and disposal of the dredge material at designated landbased disposal site(s).
  - .3 For scheduling purposes, Contractors are to note the established work effort levels per fiscal year (the 12 month period ending March 31) are as follows;
    - 2015-16 - 10%
    - 2016-17 - 90% Dredging will not start before June 13th 2016. Work will be completed by August 31, 2016

PROJECT MEASUREMENT

1. General

- .1 This section details the measurement method to be used for payment purposes. Incidental items covered in the various sections of the Specification are to be allowed for in the pricing of each pay item.
  - .2 Unit and lump sum prices are full compensation for the work necessary to complete each item in the contract, in combination for all work necessary to complete the Work as a whole, and provided in accordance with the Construction Schedule and other plans indicated requiring submittal to and approval by the Departmental Representative.
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2. Measurement  
For Payment

**Lump Sum Items: The following items (1-3) are Measured separately for costing purposes, then combined and submitted as one item under the lump sum item in the tender documents.**

1. Departmental Representative's Site Office
2. Mobilization and Demobilization
3. Sitework

The contractor will be required to provide a break breakdown of lump sum costs upon award of the contract to permit evaluation of progress claims.

**Division 01**

Departmental Representative's Site Office:

All work associated with the supply, maintenance , and removal from site of the *Departmental Representative's* site office per Section 01 51 00 of the Specification will constitute a lump sum for measurement purposes.

**Division 31**

Sitework: Sitework will be measured by lump sum. This item will include all sitework and the toe in for the rip rap slope protection as outlined by **Section 31 11 00**.

**Division 35**

Mobilization and Demobilization will be measured for payment by lump sum. This item will include all costs for mobilization and demobilization.

**UNIT PRICE ITEMS: The following items outlines the unit of measurement for unit price items as indicated in the tender documents:**

**Division 32**

Granular Sub-Base: Supply and installation of Type 2 (Class "C") granular sub-base,

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including compaction, will be measured for payment by the cubic meter.

**Division 35**

Corestone: The supply and installation of corestone will be by the tonne.

Filterstone: The supply and installation of filterstone will be measure for payment by the tonne.

Dredging:

Dredging will be measured for payment by the cubic metre placee measurement (CMPM) of material removed above the specified dredge grades and within the specified side slopes as shown on the drawings. Dredge material to be placed within the containment berm to the elevation shown on the drawings and excess removed off site. This unit price will included the provision of a boat, motor and survey equipment as specified. The unit price will also include the cost of any requirements of Nova Scotia Department of the Environment and Labour for disposal of dredge spoils on land, and the supply, installation and removal of access roads. **Note: Previous dredging projects at this site have encountered boulders and very dense material during capital dredging below previous dredge limits.**

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1. General .1 Submit to *Departmental Representative*, for review, shop drawings, product data, samples and other information specified.
- .2 Until submission is reviewed, work involving relevant product may not proceed.
2. Shop Drawings .1 Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate Sections.
- .2 Identify details by reference to sheet and detail numbers shown on Contract Drawings.
- .3 Maximum sheet size 860 X 1120 mm.
- .4 Reproductions for submissions: opaque diazo prints.
3. Product Data .1 Certain Specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings.
4. Samples .1 Submit samples in sizes and quantities specified.
- .2 Construct field samples and mock-ups at locations acceptable to *Departmental Representative*.
- .3 Accepted samples will become standards of workmanship and material against which, installed work will be checked on project.
5. Miscellaneous Data .1 Provide certificates, methodologies, designs and test results as required.
6. Coordination of Submissions .1 Review shop drawings, product data, samples and miscellaneous data prior to submission.
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- .2 Verify:
    - .1 Field Measurements.
    - .2 Field Construction Criteria.
    - .3 Catalogue numbers and similar data.
  
  - .3 Coordinate each submission with requirements of work and Contract documents. Individual submissions will not be reviewed until all related information is available.
  
  - .4 Contractor's responsibility for errors and omissions in submission is not relieved by *Departmental Representative's* review of submissions.
  
  - .5 Contractor's responsibility for deviations in submission from requirements in Contract documents is not relieved by *Departmental Representative's* review of submission, unless *Departmental Representative* gives written acceptance of specified deviations.
  
  - .6 Notify *Departmental Representative*, in writing at time of submission, of deviations from requirements of Contract documents stating reasons for deviations.
  
  - .7 After *Departmental Representative's* review, distribute copies.
7. Submission Requirements
- .1 Schedule submissions at least 14 days before dates reviewed submissions will be needed.
  
  - .2 Submit number of copies of shop drawings, product data which Contractor requires for distribution, plus 2 copies which will be retained by *Departmental Representative*.
  
  - .3 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 submitted.
    - .5 Other pertinent data.
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- .4 Submissions shall include:
    - .1 Date and revision dates.
    - .2 Project title and number.
    - .3 Name and address of:
      - .1 Contractor
      - .2 Sub-Contractor
      - .3 Supplier
      - .4 Manufacturer
      - .5 Separate detailer when pertinent
    - .4 Identification of product or material.
    - .5 Relation to adjacent structure or materials.
    - .6 Field dimensions, clearly identified as such.
    - .7 Specification Section Number.
    - .8 Applicable standards, such as CSA or CGSB numbers.
    - .9 Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract documents.
  
  - 8. Shop Drawings Review
    - .1 The review of shop drawings by Public Works and Government Services Canada or its authorized consultant is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that Public Works and Government Services Canada approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.
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9. Other Reviews .1 As for shop drawings above, other reviews are for the sole purpose of ascertaining conformance with the general concept.
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PART 1 - GENERAL

1.1 Related Work

- .1 Section 01 35 24: Special Procedures on Fire Safety Requirements.
- .2 Section 01 35 25: Special Procedures on Lockout Requirements

1.2 Definitions

- .1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2 Competent Person: means a person who is:
  - .1 Qualified by virtue of personal knowledge training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
  - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
  - .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.
- .3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 PPE: personal protective equipment.
- .5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.3 Submittals

- .1 Make submittals in accordance with Section 01 33 00.

- .2 Submit site-specific Health and Safety Plan prior to commencement of Work.
  - .1 Submit within 21 work days of notification of Bid Acceptance. Allow for 5-10 days for Department review and recommendations prior to the commencement of work. Provide [3] copies.
  - .2 Departmental Representative will review Health and Safety Plan and provide comments.
  - .3 Revise the Plan as appropriate and resubmit within [5][10] work days after receipt of comments.
  - .4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.
  - .5 Submit revisions and updates made to the Plan during the course of Work.
- .3 Submit name of designated Health and Safety Site Representative and support documentation specified in the Safety Plan.
- .4 Submit building permit, compliance certificates and other permits obtained.
- .5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other Department of Labour organization.
  - .1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.
- .6 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .7 Submit copies of incident reports.
- .8 Submit WHMIS MSDS - Material Safety Data Sheets.

1.4 Compliance Requirements

- .1 Comply with the Occupational Health and Safety Act for the Province of Nova Scotia, and the Regulations made pursuant to the Act.
- .2 Comply with Canada Labour Code - Part II (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations as well as any other regulations made pursuant to the Act.
  - .1 The Canada Labour Code can be viewed at: [laws-lois.justice.gc.ca/eng/acts/L-2\\_fulltext.html](http://laws-lois.justice.gc.ca/eng/acts/L-2_fulltext.html)
  - .2 Canadian Occupational Health and Safety Regulations can be viewed at: [Laws-lois.justice.gc.ca/eng/regulations/SOR-86-304/index.html](http://Laws-lois.justice.gc.ca/eng/regulations/SOR-86-304/index.html)
  - .3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: 819-956-4800 or 1-800-635-7943 Publication No. L31-85/2000 (E or F).
- .3 Treasury Board of Canada Secretariat (TBS):
  - .1 Treasury Board, Fire Protection Standard April 1, 2010  
[www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text](http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text)
- .4 Canadian Standards Association (CSA):
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .5 Observe construction safety measures of:
  - .1 NBC 2010, Division B, Part 8.
  - .2 Municipal by-laws and ordinances.
- .6 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.
- .7 Maintain Workers Compensation Coverage in good standing duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.

- 
- .8 Medical Surveillance: Where prescribed by legislation or regulation. Obtain and maintain worker medical surveillance documentation.
- 1.5 Responsibility
- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons and environment adjacent to the site to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by all workers, sub-contractors and other persons granted access to Work Site with safety requirements of Contract Documents, applicable federal, provincial, and local by-laws, regulations, and ordinances, and with site-specific Health and Safety Plan.
- 1.6 Site Control and Access
- .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.
- .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.
- .2 Isolate Work Site from other areas of the premises by use of appropriate means.
- .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular

traffic around and adjacent to the Work and create a safe environment.

- .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
- .3 Use professionally made signs with bilingual message in the 2 official languages or international known graphic symbols.

.3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.

.4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.

.5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm. [Provide security guard where adequate protection cannot be achieved by other means].

1.7 Protection

.1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work.

.2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.8 Filing of Notice

.1 File Notice of Project with pertinent provincial health and safety authorities prior to beginning of Work.

- .1 Departmental Representative will assist in locating address if needed.

1.9 Permits

- .1 Post permits, licenses and compliance certificates, specified in section [01 10 10], at Work Site.
- .2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.

1.10 Hazard Assessments

- .1 Perform site specific health and safety hazard assessment of the Work and its site.
- .2 Carryout initial assessment prior to commencement of Work with further assessments as needed during progress of work, [including when new trades and subcontractors arrive on site].
- .3 Record results and address in Health and Safety Plan.
- .4 Keep documentation on site for entire duration of the Work.

1.11 Project/Site Conditions

- .1 Following are potential health, environmental and safety hazards at the site for which Work may involve contact with:
  - .1 Existing hazardous and controlled products stored on site:
    - .1 [\_\_\_\_\_].
    - .2 [\_\_\_\_\_].
  - .2 Existing hazardous substances or contaminated [building] materials:
    - .1 [\_\_\_\_\_].
    - .2 [\_\_\_\_\_].
  - .3 Known latent site and environmental conditions:
    - .1 [\_\_\_\_\_].
    - .2 [\_\_\_\_\_].
  - .4 Facility on-going operations:
    - .1 [\_\_\_\_\_].

.2 [\_\_\_\_\_].

- .2 Above items shall not be construed as being complete and inclusive of potential health and safety hazards encountered during Work.
- .3 Include above items in the hazard assessment of the Work.
- .4 MSDS Data sheets of pertinent hazardous and controlled products stored on site can be obtained from Departmental Representative.

1.12 Meetings

- .1 Attend pre-construction health and safety meeting, convened and chaired by Departmental Representative, prior to commencement of Work, at time, date and location determined by Departmental Representative. Ensure attendance of:
  - .1 Superintendent of Work.
  - .2 Designated Health and Safety Site Representative
  - .3 Subcontractors
- .2 Conduct regularly scheduled tool box meetings during the Work in conformance with Occupational Health and Safety regulations.
- .3 Keep documents on site.

1.13 Health and Safety Plan

- .1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from the site.
- .2 Health and Safety Plan shall include the following components:
  - .1 List of health and safety risks and safety hazards identified by hazard assessment.

- .2 Control measures used to mitigate risks and hazards identified.
- .3 On-site Contingency and Emergency Response Plan as specified below.
- .4 On-site communications Plan as specified below.
- .5 Name of Contractor's designated Health and Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
- .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.
- .3 On-site Contingency and Emergency Response Plan shall include:
  - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
  - .2 Evacuation Plan: site and floor plan layouts showing escape routes, marshalling areas. Details on alarm notification methods, fire drills, location of fire fighting equipment and other related data.
  - .3 Name, duties and responsibilities of persons designated as Emergency Warden (s) and deputies.
  - .4 Emergency Contacts: name and telephone number of officials from:
    - .1 General Contractor and Subcontractors.
    - .2 Pertinent Federal and Provincial

- 
- Departments and Authorities having jurisdiction.
  - .3 Local emergency resource organizations.
  - .5 Harmonize Plan with Facility's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including the name of PWGSC and Facility Management contacts.
  - .4 On-site communications Plan:
    - .1 Procedures for sharing of work related Safety information to workers and subcontractors , including emergency and evacuation measures.
    - .2 List of critical work activities to be communicated with Facility Managers which have a risk of endangering health and safety of Facility users.
  - .5 Address all activities of the Work including those of subcontractors.
  - .6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade pr subcontractor arrive at Work site.
  - .7 Departmental Representative will response in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.
  - .8 Post copy of the Plan, and updates, prominently on Work Site

1.14 Safety  
Supervision

- .1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.
- .2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
  - .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work
  - .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
  - .3 Conduct site safety orientation session to persons granted access to Work Site.
  - .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
  - .5 Stop the Work as deemed necessary for reasons of health and safety.
- .3 Health & Safety Site Representative must:
  - .1 Be qualified and competent person in occupational health and safety.
  - .2 Have site-related working experience specific to activities of the Work.
  - .3 Be on Work Site at all times during execution of the Work.
- .4 All supervisory personnel assigned to the Work shall also be competent persons.
- .5 Inspections:
  - .1 Conduct regularly scheduled safety inspections of the Work on a minimum [bi-weekly] basis. Record deficiencies and remedial action taken.

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- .
- 1.15 Training .1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.
- .2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.
- .3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- 1.16 Minimum Site Safety Rules .1 Notwithstanding requirement to abide by federal and provincial health and safety regulations; ensure the following minimum safety rules are obeyed by persons granted access to Work Site:
- .1 Wear appropriate PPE pertinent to the Work or assigned task; minimum being hard hat, safety footwear, safety glasses and hearing protection.
- .2 Immediately report unsafe condition at site, near-miss accident, injury and damage.
- .3 Maintain site and storage areas in a tidy condition free of hazards causing injury.
- .4 Obey warning signs and safety tags.
- .2 Brief persons of disciplinary protocols to be taken for noncompliance. [Post rules on site].
- 1.17 Correction for Non Compliance .1 Immediately address health and safety non-compliance issues identified by

authority having jurisdiction or by  
Departmental Representative.

- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

1.18 Incident Reporting

- .1 Investigate and report the following incidents to Departmental Representative:
  - .1 Incidents requiring notification to Provincial Department of Occupational Safety and Health, Workers Compensation Board or to other regulatory Agency.
  - .2 Medical aid injuries.
  - .3 Property damage in excess of \$10,000.00.
  - .4 Interruptions to Facility operations resulting in an operational lost to a Federal department in excess of \$5,000.00.
- .2 Submit report in writing.

1.19 Hazardous Products

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets for all products delivered to site
  - .1 Post on site.
  - .2 Submit copy to Departmental Representative
- .3 Post all MSDS data sheets on site, in a common area, visible to workers.

1.20 BLASTING

- .1 Blasting or other use of explosives is not permitted on site [without prior receipt of

written permission and instructions from  
Departmental Representative].

- 1.21 POWDER ACTUATED DEVICES .1 Abide by occupational health and safety regulations regarding work in confined spaces.
  
- 1.22 CONFINED SPACES .1 Maintain on site copy of safety documentation as specified in this section and other safety related reports and documents issued to or received from authorities having jurisdiction.  
  
.2 Make available to *Departmental Representative*, or authorized safety representative, for inspection upon request.
  
- 1.23 SITE RECORDS .1 Maintain on Work Site copy of safety related documentation and reports stipulated to be produced in compliance with Acts and Regulations of authorities having jurisdiction and of those documents specified herein.  
  
.2 Upon request, make available to Departmental Representative or authorized Safety Officer for inspection.
  
- 1.24 POSTING OF DOCUMENTS .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on Work Site in accordance with Acts and Regulations of Province having jurisdiction.  
  
.2 Post other documents as specified herein, Including:
  - .1 Site specific Health and Safety Plan.
  - .2 WHMIS data sheets.
  - .3 [\_\_\_\_\_].

PART 2 - PRODUCTS

- 2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used.

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1.1 References

- .1 Canada Shipping Act, Transport Canada, 2001, amended 2013-12-01
- .2 Canadian Coast Guard Regulations, Fisheries and Oceans Canada
- .3 Canadian Environmental Assessment Act, 2012, amended 2013-11-25
- .4 Canadian Environmental Protection Act, 1999, amended on 2014-03-28
- .5 Fisheries Act, 1985, Fisheries and Oceans Canada, amended 2013-11-25
- .6 Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters, 1998
- .7 Migratory Birds Convention Act, 1994, Environment Canada, amended 2010-12-10
- .8 Navigation Protection Act, 1985. Transport Canada, amended 2014-04-01
- .9 Nova Scotia - Environment Act
- .10 Species at Risk Act, 2002, amended 2013-03-08
- .11 The Federal Policy on Wetland Conservation, 1991, Environment Canada
- .12 Transportation of Dangerous Goods Act, 1992, Transport Canada, amended 2009-06-16
- .13 Workplace Hazardous Materials Information System, Health Canada.

1.2 Definitions

- .1 Archaeological resources: all tangible evidence of human activity that is of historical, cultural or scientific interest. Examples include features, structures, archaeological objects or remains at or from an archaeological site, or an object recorded as an isolated archaeological find.
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- .2 Buffer zone: a vegetated land that protects watercourses from adjacent land uses. It refers to the land adjacent to watercourses, such as streams, rivers, lakes, ponds, oceans, and wetlands, including the floodplain and the transitional lands between the watercourse and the drier upland areas.
  - .3 Deleterious substance: (a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or (b) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water.
  - .4 Fish habitat: spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes.
  - .5 Hazardous material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
  - .6 Invasive or alien species: refers to a species or subspecies introduced outside its normal distribution whose establishment and
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spread threaten ecosystems, habitats or species with economic or environmental harm.

.7 Navigable water: a canal and any other body of water created or altered as a result of the construction of any work.

.8 Surface watercourse: refers to the bed and shore of a river, stream, lake, creek, pond, marsh, estuary or salt-water body that contains water for at least part of each year.

.9 Wetlands: land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or "peatlands," and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat.

1.3 Transportation

.1 Transport hazardous materials and hazardous waste in compliance with the Transportation of Dangerous Goods Act.

.2 Eliminate free board spillage when excavating, loading and hauling dredged material.

.3 Trucks transporting dredged material will have watertight boxes.

.4 Do not overload trucks when hauling dredged material.

.5 Maintain trucks clean and free of mud, dirt and other foreign matter.

.6 Secure contents against spillage. Avoid potential release of contents and of any foreign matter onto highways, roads and access routes used for the work. Immediately clean any ground spills and soils to extent as directed by authority having jurisdiction.

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- .7 Prior to commencement of work, advise and seek approval from the *Departmental Representative* of the existing roads and temporary routes / roads (including the construction of any temporary causeways or access roads for the purposes of dredging) proposed to be used to access work areas and to haul material to and from the site, including roads to the dredge material disposal site.
  - .8 Construction material and debris is not to become waterborne.
  - .9 Any tools, equipment, vehicles, temporary structures or parts thereof used or maintained for the purpose of building or placing a work in navigable water are not to remain in place after the completion of the project.
  - .10 Vessels are to be permitted safe access through the worksite at all times, and assisted as necessary.
  - .11 Vessels should be compliant with all *Canada Shipping Act, 2001*, requirements for inspection, which includes certification of the vessel and adequate training and appropriate certificate of competency for the operators.
  - .12 All materials and equipment used in construction must be marked in accordance with the Collision Regulations of the *Canada Shipping Act, 2001* when located on the waterway.
  - .13 Advise the Canadian Coast Guard, Marine Communication and traffic Services (MCTS) at (902) 564-7751 or toll free at 1-800-686-8676 sufficiently in advance of commencement of work or when deploying or removing site markings in order to allow for appropriate Notices to Shipping/Mariners action.
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- .14 Work activities must comply with all / any conditions of the Navigation Protection Act (NPA) permit issued by Transport Canada.

1.4 Temporary Causeways  
and Access Roads

- .1 It will be the Contractor's responsibility to gain access to the dredge area. The construction and removal of temporary causeways and access roads will be at the Contractor's expense and will be removed immediately after clearance of the dredge area.
- .2 It will be the Contractor's responsibility to identify a location for the disposal of material imported by the Contractor for the construction of temporary causeways and access roads.
- .3 All material used for construction of temporary causeways and access roads must be clean and free from excessive fines, organics, debris and non-toxic (i.e., free of fuel, oil, grease and/or any other contaminants), non-ore bearing and from a provincially approved non-water source.
- .4 Material is to be screened, if required, to ensure that no fines or stones less than 0.2 kilograms are placed in the work. Gradation of the material to be imported for the construction of the causeways, roads etc. shall be within the following limits:

IMPERIAL SIZE	METRIC SIZE	PERCENT PASSING
18"	450 mm	100
8"	200 mm	44-75
4"	100 mm	24-50
2"	50 mm	7-14

- .5 Heavy machinery and equipment must be operated from a dry platform only. Temporary causeways and access roads shall be
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constructed at an elevation such that machinery and equipment is operating completely out of the water at all stages of the tide. If tidal work is being carried out, machinery and equipment shall be relocated back to a suitable elevation to prevent operating in submerged waters.

- .6 The Contractor is to maintain temporary buoys to mark the position of the access road including the outer toe as construction proceeds. All buoys are to meet requirements of the applicable Canadian Coast Guard standard and be equipped with radar reflectors.

1.5 Operation of Machinery

- .1 Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.
- .2 Whenever possible, operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the water body.
- .3 Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

.6 Disposal of Dredged Material

- .1 Material will be disposed of on land owned by Small Craft Harbour property located in Cripple Creek and in Newellton, Shelburne County, NS as shown in Sheet 2 of 6 - Plan of New Work.
- .2 Water that decants from the disposed dredge spoil shall not enter any waterways.
- .3 Site should allow for diffuse, dispersion or diversion onto a field or woodland, but not
-

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into drainage ditches that would carry water to a waterway.

- .4 The Marine Sediment Sampling Program report is included in Appendix [C].
- .5 Place and spread dredged material at the disposal site in a uniform and well graded manner. Minimize height and slopes of the disposed material. Match slopes and contours of the existing surrounding terrain as much as possible.
- .6 Items such as rubber tires, bottles, cans and other debris or litter must be removed from the disposal site following regrading. Failure to remove such debris may constitute a littering offence under applicable regulations.
- .7 Control runoff of water containing suspended materials or other harmful substances in accordance with requirements of all federal, provincial and municipal authorities having jurisdiction.
- .8 Obtain approval from *Departmental Representative* of the proposed route to be used to haul dredged material to the disposal site.

1.7 Containment and Spill Management

- . 1 Comply with Federal (CEPA *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*) and Provincial regulations, codes, standards and guidelines for the storage of fuel and allied petroleum products on site.
  - .2 Do not dump petroleum products or any other deleterious substances on ground or in the water.
  - .3 Be diligent and take all necessary precautions to avoid spills and contaminate
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the soil and water (both surface and subsurface) when handling petroleum products on site and during fueling and servicing of vehicles and equipment.

- .4 Maintain on site appropriate emergency spill response equipment consisting of at least one 250-litre (55 gallon) overpack spill kit for containment and cleanup of spills.
- .5 Maintain vehicles and equipment in good working order to prevent leaks on site.
- .6 In the event of a petroleum spill, immediately notify the *Departmental Representative* and the Canadian Coast Guard (CCG) at 1-800-565-1633 (24 hour report line). Perform clean-up in accordance with all regulations and procedures stipulated by authority having jurisdiction.
- .7 Materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals are not to enter the watercourse.
- .8 Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance.
- .9 Ensure that all vessels will have procedures in place to ensure safeguards against marine pollution: awareness training of all employees, means of retention of waste oil on board and discharge to shore based reception facilities, capacity of responding to and clean-up of accidental spill caused by vessels involved in any particular project.

1.8 Hazardous

Material Handling

- .1 Store and handle hazardous materials in accordance with applicable federal and provincial regulations, codes, standards and
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- guidelines. Store in location that will prevent spillage into the environment.
- .2 Label containers to WHMIS requirements and keep MSDS data sheets on site for all hazardous materials.
  - .3 Maintain inventory of hazardous materials and hazardous waste stored on site. List items by product name, quantity and date when stored.
  - .4 Store and handle flammable and combustible materials in accordance with National Fire Code.
- 1.9 Disposal of Wastes
- .1 Do not bury rubbish, construction and demolition debris (i.e., concrete, creosote timbers, steel, impacted soil materials etc.) and waste materials on site.
  - .2 Dispose and recycle construction and demolition debris and waste materials in accordance with Provincial Waste Management Regulations and the project waste management requirements specified in section 02 41 23 - Demolition and Removals.
  - .3 Do not dispose of hazardous waste, volatile materials (such as mineral spirits, paints, thinners etc.) and petroleum products into waterways, storm or sanitary sewers or in waste landfill sites.
  - .4 Dispose of hazardous waste in accordance with applicable federal and provincial, regulations, codes, standards and guidelines.
- 1.10 Water Quality
- .1 Conduct dredging of a watercourse in such a manner to limit turbidity and reduce sediment suspension in the water to an absolute minimum at all times.
    - .1 Maintain appropriate production speed and momentum of the excavation equipment. Make adjustments as required
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and as approved by *Departmental Representative*.

.2 Strategically position excavator equipment and haul vehicles to avoid over the water swings of dredged material whenever possible.

.3 Restrict the amount of material dredged to the area and depth required for navigation.

.4 Avoid bottom stockpiling, dragging or side casting material during dredging. If these activities are being proposed, the Contractor must:

a) employ suitable operational and engineering controls (e.g., silt curtain), as approved by the *Departmental Representative*, around the dredge work area, or

b) hire a qualified professional to develop a Water Quality Monitoring (WQM) program for the site. The Contractor will not be permitted to start any in-water work or dredging until the WQM program is approved by the *Departmental Representative*. The WQM program will require direct-read turbidity measurements from a data-logger as well as collection of water samples for Total Suspended Solids (TSS) for off-site analysis in a certified laboratory. The WQM program will include a suitable number of fixed collection points from which data shall be collected prior to any dredging operations to establish background levels of turbidity and TSS. A collection point must also be established for the collection of data within 30 meters of the dredge while the dredge is operating. If the turbidity and TSS results at any of the collection points exceed the CCME

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Water Quality Guidelines for the Protection of Aquatic Life, the Contractor shall cease dredging operations immediately and a DFO Fisheries Protection Program (FPP) Biologist must be contacted at 902-401-0897 to determine what adaptive measures shall be employed including additional operational and engineering controls (e.g. silt curtains).

- .2 Where work may affect the water quality adjacent to water intake lines used by lobster holding facilities, fish processing facilities and other harbour users, schedule work in cooperation with the Harbour Authority as directed by *Departmental Representative* to minimize interference and impact to harbour users.
  - .3 Do not wash down equipment within a 30 metre buffer zone of a wetland, watercourse or other identified environmentally sensitive area.
  - .4 Where required, install effective sediment control measures before starting work to prevent the entry or re-suspension of sediment in the water body. Inspect sediment control measures regularly to ensure they are functioning properly, and make all necessary repairs if any damage occurs. Upon completion of use, remove these control measures in a way that prevents the escape of settled sediment.
  - .5 Develop and implement an Erosion and Sediment Control Plan for the site that minimizes risk of sedimentation of the water body during all phases of the work. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the water body or settling
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basin and runoff water is clear. The plan should, where applicable, include:

- a) Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body.
  - b) Measures for managing water flowing onto the site, as well as water being pumped / diverted from the site such that sediment is filtered out prior to the water entering a water body. For example, pumping / diversion of water to a vegetated area, construction of a settling basin or other filtration system.
  - c) Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., dredging, underwater cable installation).
  - d) Measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby water bodies to prevent re-entry.
  - e) Regular inspection and maintenance of erosion and sediment control measures and structures during the course of the work.
  - f) Repairs to erosion and sediment control measures and structures if damage occurs.
  - g) Removal of non-biodegradable erosion and sediment control materials once site is stabilized.
  - h) Description of approach for managing potential impacts to the local environment including silt curtains, sediment fence, hay bales, treatment, etc.
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1.11 Blasting

- .1 Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.
  
  - .2 If explosives are required as part of a project (e.g., removal of structures such as piers, pilings, footings; removal of obstructions such as beaver dams; or preparation of a river or lake bottom for installation of a structure such as a dam or water intake), the potential for impacts to fish and fish habitat should be minimized by implementing the following measures:
    - .1 Time in-water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate Fisheries & Oceans Canada timing windows.
    - .2 Isolate the work site to exclude fish from within the blast area by using bubble / air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aquadams.
    - .3 Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting.
    - .4 Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e., decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations.
    - .5 Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed / water interface to confine the blast.
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- .6 Place blasting mats over top of holes to minimize scattering of blast debris around the area.
  - .7 Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products.
  - .8 Remove all blasting debris and other associated equipment / products from the blast area.

1.12 Socioeconomic  
Restrictions

- .1 Abide by municipal and provincial regulations for any restrictions on work performed during the night time and on flood lighting of the site. Obtain applicable permits.
- .2 Place flood lights in opposite direction of adjacent residential and business areas.
- .3 Work equipment and machinery must be equipped with purposely designed mufflers to reduce noise on site to lowest possible level. Maintain mufflers in good operating condition at all times.

1.13 Bird and Bird  
Habitat

- .1 Become knowledgeable with and abide by the Migratory Birds Convention Act (MBCA) in regards to the protection of migratory birds, their eggs, nests and their young encountered on site and in the vicinity.
  - .2 Minimize disturbance to all birds on site and adjacent areas during the entire course of the Work.
  - .3 Do not approach concentrations of seabirds, waterfowl and shorebirds when anchoring equipment, accessing wharves or ferrying supplies.
  - .4 During night time work, shield flood lights, point them downwards and position them in opposite direction of nearby bird nesting habitat.
-

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- .5 No staging of vehicles or equipment/material storage will take place on any beaches or dunes.
  - .6 Should nests of migratory birds in wetlands be encountered during work, immediately notify *Departmental Representative* for directives to be followed.
    - .1 Do not disturb nest site and neighbouring vegetation until nesting is completed.
    - .2 Minimize work immediately adjacent to such areas until nesting is completed.
    - .3 Protect these areas by following recommendations of Canadian Wildlife Service.
  - .7 Equipment must be equipped with standard, maintained noise suppression devices to minimize disturbance to birds.

1.14 Fish Protection

- .1 Avoid wet, windy and rainy periods that may increase erosion and sedimentation.
  - .2 Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.
  - .3 Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.
  - .4 Be aware of the risk for contamination of the fish habitat at the site as a result of alien species being introduced in the water.
  - .5 To minimize the possibility of fish habitat contamination and the spread of aquatic
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invasive (alien species), all construction equipment which will be immersed into the water of a watercourse, or has the possibility of coming into contact with such water during the course of the work, must be cleaned and washed to ensure that they are free of marine growth and alien species.

- .1 Equipment shall include boats, barges, cranes, excavators, haul trucks, pumps, pipe lines and all other miscellaneous tools and equipment previously used in a marine environment.
  - .6 Cleaning and washing of equipment shall be performed immediately upon their arrival at the site and before use in or over the body of water.
  - .7 Conduct cleaning and washing operations as follows:
    - .1 Scrape and remove heavy accumulation of mud and dispose appropriately.
    - .2 Wash all surfaces of equipment by use of a pressurized fresh water supply.
    - .3 Immediately follow with application of a heavy sprayed coating of undiluted vinegar or other environmentally approved cleaning agent to thoroughly remove all plant matter, animals and sediments.
    - .4 Check and remove all plant, animal and sediment matter from the all bilges and filters.
    - .5 Drain standing water from equipment and let fully dry before use.
    - .6 Upon removal from the water, drain standing water from equipment and let fully dry before removal off the site.
  - .8 Do not perform cleaning and washdown within a 30 metre buffer zone of a wetland, watercourse or other identified environmentally sensitive area.
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- .9 Record of Assurance Logbook:
- .1 Maintain an on-going log of past and present usage and washdowns of all equipment to illustrate mitigation measures undertaken against fish habitat contamination by alien species.
  - .2 Write data in a hard cover bound logbook to include the following:
    - .1 Date and location where equipment was previously used in a watercourse or wetland;
    - .2 Type of work performed.
    - .3 Dates of wash down for each piece of equipment;
    - .4 Cleaning method and cleaning agent(s) used.
  - .10 Keep Record of Assurance Logbook updated from project to project. Upon request, submit logbook to *Departmental Representative* for review.
  - .11 Abide by requirements and recommendations from Fisheries and Oceans Canada - Fisheries Protection Program in cleaning and wash down of equipment.
  - .12 Work activities must comply with all / any conditions of the Fisheries Act Authorization issued by Fisheries and Oceans Canada. A copy of the Fisheries Act Authorization must be kept on site at all times.
  - .13 To protect fish, fish adjacent to the harbour, suspended sediment levels shall not exceed 25 milligrams per litre (mg/l) or 8 nephelometric turbidity units (NTUs) above background at 100 m from the nearest infill site over a 24 hour period. Background levels shall be measured at least 500 m from the project site in a non-disturbed area and upstream from any sediment movement. An independent consultant will be collecting samples to document concentrations of these parameters. The Contractor shall cease
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operations immediately and a DFO Fisheries Protection Program (FPP) Biologist must be contacted at 902-402-0298 to determine what adaptive measures shall be employed including additional operational and engineering controls (e.g. silt curtains).

1.15 Air Quality

- .1 Keep airborne dust and dirt resulting from the work on site to an absolute minimum.
- .2 Dust suppression by the application of water must be employed, when required. Apply dust control measures to roads, parking lots and work areas. The *Departmental Representative* shall determine locations where water is to be applied, the amount of water to be applied, and the times at which it shall be applied. Waste oil must not to be used for dust control under any circumstances.
- .3 Spray surfaces with water or other environmentally approved product. Use purposely suited equipment or machinery and apply in sufficient quantity and frequency to provide effective result and continued dust control during the entire course of the work.
- .4 Do not use oil or any other petroleum products for dust control.

1.16 Fires

- .1 Fires and burning of rubbish on site is not permitted.

1.17 Archaeological

- .1 All construction personnel are responsible for reporting any unusual materials unearthed during construction to the construction supervisor. If the find is believed to be an archaeological resource, the construction supervisor will immediately stop work in the vicinity of the find and notify his / her immediate supervisor.
  - .2 If an archaeological and / or historically significant item is discovered during dredging or excavation, work in the area will be stopped immediately and the *Departmental*
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*Representative* will be contacted as well as the provincial Archaeological Services unit:

a) Nova Scotia - NS Department of Communities, Culture and Heritage, Special Places Program - Nova Scotia Museum telephone: (902) 424-6461

- .3 Work can only resume in the vicinity of the find when authorized by the PWGSC Project Manager and Construction Supervisor, after approval has been granted by the Nova Scotia Department of Communities, Culture and Heritage.
- .4 In the event of the discovery of human remains or evidence of burials, the excavation work will immediately cease and nearest law enforcement agency will be contacted immediately by the PWGSC Project Manager and/or the Construction Supervisor.
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1. Access
    - .1 Provide and maintain adequate access to project site.
    - .2 If authorized to use existing roads or structures for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.
    - .3 The contractor is to maintain full access to the work site. Should a court injunction be required ordering a person or group to refrain from impeding access to the site, such as a demonstration, picketing or union action, then obtaining the injunction and any associated costs will be considered incidental to this contract. Any delays associated with such activity will be considered incidental to this contract.
  
  2. Contractor's Site Office
    - .1 Establish on the site of the work and keep open at all times during the execution of the work an office where all letters, orders, notices and other communications may be received or acknowledged either by the Contractor or his authorized agent or representative. Provide a telephone in the office.
    - .2 Keep one up-to-date copy of contract documents, bulletins and other materials as specified under **Section 01 10 10**.
  
  3. Departmental Representative's Site Office
    - .1 Provide temporary office for sole use of *Departmental Representative*, complete with heat and lights. Insulated office required during October to May. Locate on or adjacent to site.
    - .2 Inside dimensions minimum 5 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.
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- .3 Arrange and pay for telephone and fax machine installation and service in *Departmental Representative's* office for the *Departmental Representative's* exclusive use. Long distance calls placed on this phone by the *Departmental Representative* will be paid for by *Departmental Representative*.
  - .4 Washroom facilities not required in the office. Provide outside sanitary facilities to approval.
  - .5 Equip office with six chairs, flat 1200 X 2400 X 25 table with writing surface and 4 drawer lockable filing cabinet.
  - .6 Maintain in clean condition.
4. Storage Sheds
- .1 Provide adequate weather tight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.
  - .2 Contractor to make his own arrangements for on-site storage areas.
5. Sanitary Facilities
- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
  - .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
6. Parking
- .1 Contractor to make own arrangements to provide parking space for work force.
7. Power
- .1 Arrange, pay for and maintain temporary electrical power supply in accordance with governing regulations and ordinances.
  - .2 Install temporary facilities for power such as pole lines and cables to approval of local power supply authority.
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| 8.  | <u>Water Supply</u>                    | .1 | Arrange, pay for and maintain temporary water supply in accordance with governing regulations and ordinances.  |
| 9.  | <u>Barricades</u>                      | .1 | Provide and maintain sufficient barricades, fencing, notices, warning signs, light signals, etc. for the protection of adjoining property and to warn others and workmen engaged on the job of the dangers caused by the work. |
|     |  | .2 | Types and location of barricades, etc. to be in accordance with local regulations and to the satisfaction of <i>Departmental Representative</i> .  |
|     |  | .3 | The presence of such barricades, lights, etc. shall not relieve the Contractor of the responsibility for any damages.  |
| 10. | <u>Security</u>                        | .1 | Contractor to make his own arrangements for security of his equipment, materials, damages resulting from fire and theft.   |
| 11. | <u>Site Signs and Notices</u>          | .1 | Only Project Identification and Consultant/ Contractor signboards and notices for safety or instruction are permitted on site.   |
|     |  | .2 | Format, location and quantity of site signs and notices to be accepted by <i>Departmental Representative</i> .   |
|     |  | .3 | Signs and notices for safety or instruction to be in English and French languages, or commonly understood graphic symbols.   |
| 12. | <u>Removal of Temporary Facilities</u> | .1 | Remove temporary facilities from site when directed by <i>Departmental Representative</i> .  |
|     |  | .2 | When project is closed down for a period of time, keep temporary facilities operational until no longer required by <i>Departmental Representative</i> .   |
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1. General
    - .1 Use new material and equipment unless otherwise specified.
    - .2 Submit following information for any or all materials and products proposed for supply within 7 days of request by *Departmental Representative*:
      - .1 name and address of manufacturer
      - .2 trade name, model and catalogue number
      - .3 performance, descriptive and test data
      - .4 manufacturer's installation or application instructions
      - .5 evidence of arrangements to procure.
    - .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
    - .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
  2. Manufacturers Instructions
    - .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
    - .2 Notify *Departmental Representative* in writing of any conflict between these specifications and manufacturers instructions. *Departmental Representative* will designate which document is to be followed.
  3. Fastenings-General
    - .1 All fastenings are to be the sizes indicated on the contract plans and are to be hot dipped galvanized to CSA-G164 Latest Edition unless otherwise noted.
  4. Delivery and Storage
    - .1 Deliver, store and maintain packaged material and equipment with manufacturer's seal and labels intact.
    - .2 Prevent damage, adulteration and soiling of material and equipment during delivery,
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- handling and storage. Immediately remove rejected material and equipment from site.
- .3 Store material and equipment in accordance with supplier's instructions.
5. Conformance .1 When material or equipment is specified by standard or performance specifications, upon request of *Departmental Representative*, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.
6. Substitution .1 Proposals for substitution may be submitted only after award of Contract. Such requests must include statements of respective costs of items originally specified and proposed substitutions.
- .2 Proposals will be considered by *Departmental Representative* if:
- .1 Products selected by tenderer from those specified, are not available, or
- .2 Delivery date of products from those specified would unduly delay completion of Contract, or
- .3 Alternative products to those specified, which are brought to attention of, and considered by *Departmental Representative* as equivalent to those specified and will result in a credit to Contract amount.
- .3 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on project. Pay for design or drawing changes required as result of substitution.
- .4 Amounts of all credits arising from approval of substitutions will be determined by *Departmental Representative* and Contract price will be reduced accordingly. No substitutions will be permitted without prior
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- written approval of *Departmental Representative*.
- .5 Departmental Representative reserves the right for acceptance or rejection of substitution of materials.
7. Construction  
Equipment and Plant .1 On request, prove to the satisfaction of *Departmental Representative* that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
- .2 Maintain construction equipment and plant in good operating order.
8. Damaged and  
Rejected Materials .1 Immediately replace, repair or otherwise make good any material damaged, broken or defaced during construction to the satisfaction of *Departmental Representative*.
- .2 Remove rejected materials from site.
-

1. Record Drawings
    - .1 *Departmental Representative* will provide two sets of white prints for record drawing purposes.
    - .2 Maintain project record drawings and accurately record deviations from contract documents caused by site conditions and changes ordered by *Departmental Representative*.
    - .3 Mark changes in red coloured ink.
    - .4 Record following information:
      - .1 Elevations of various elements in relation to Chart Datum.
      - .2 Field changes in dimensions and details.
      - .3 Changes made by Change Order.
    - .5 At completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to *Departmental Representative*.
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1. General
    - .1 Conduct cleaning and disposal operations to comply with ordinances and antipollution laws.
    - .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
    - .3 Prevent accumulation of waste which create hazardous conditions.
  
  2. Cleaning During Construction
    - .1 Maintain the work, at least on a daily basis free from accumulations of waste material and debris.
    - .2 Provide on-site containers for collection of waste materials, and debris.
    - .3 Remove waste materials, and debris from site.
    - .4 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet concrete or newly painted surfaces.
  
  3. Final Cleaning
    - .1 In preparation for acceptance of the project on an interim or final certificate of completion perform final cleaning.
    - .2 Remove grease, dust, dirt, stains, and other foreign materials from finished surfaces.
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PART 1 - GENERAL

1.1 Related Work

- .1 Refer to other Specification Sections for related information.

1.2 Source Approval

- .1 Source of materials to be incorporated into work or stockpiled requires acceptance.
- .2 Inform *Departmental Representative* of proposed source of aggregates and provide access for sampling at least 3 weeks prior to commencing production.
- .3 If, in opinion of *Departmental Representative*, materials from the proposed source do not meet, or cannot reasonably be processed to meet specified requirements, procure an alternative source to demonstrate that materials from source in question can be processed to meet specified requirements.
- .4 Should a change of material source be proposed during work, advise *Departmental Representative* 3 weeks in advance of proposed change to allow sampling and testing.
- .5 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

1.3 Production Sampling

- .1 Aggregate will be subject to continual sampling during production.
- .2 Provide *Departmental Representative* with ready access to source and processed material for purpose of sampling and testing.

- 1.4 Measurement for Payment .1 This item will not be measured separately.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material or other deleterious substances.
  - .2 Flat and elongated particles are those whose greatest dimension exceeds four times their least dimension.
  - .3 Fine aggregates satisfying requirements of applicable section shall be one, or a blend of following:
    - .1 Natural sand
    - .2 Manufactured sand
    - .3 Screening produced in crushing of quarried rock, boulders, gravel or slag
    - .4 Coarse aggregates satisfying requirements of applicable section shall be one of following:
      - .1 Crushed rock or slag
      - .2 Gravel composed of naturally formed particles of stone.

PART 3 - EXECUTION

- 3.1 Development of Aggregate Source
- .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by the *Departmental Representative*.
  - .2 Clear, grub and strip an area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.

- .3 When operating in stratified deposits use excavation equipment and methods that will produce a uniform, homogeneous aggregate.
- .4 When excavation is completed, provide drains or ditches as required to prevent surface standing water.
- .5 Trim off and dress slopes of waste material piles and leave site in a neat condition.

### 3.2 Processing

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregate if required to obtain gradation requirements specified. Use approved methods and equipment.
- .3 Blending to increase percentage of crushed particles or decrease percentage of flat and elongated particles is permitted.
- .4 Wash aggregates if required to meet specifications. Use only equipment accepted by *Departmental Representative*.

### 3.3 Handling

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

### 3.4 Stockpiling

- .1 Stockpiling aggregates on stabilized, clean and well drained surfaces.
- .2 To ensure that no material other than stockpiled aggregate is used, do not incorporate bottom 250 mm of stockpile into work, if aggregates are stockpiled on ground.

- .3 Stockpile far enough apart to prevent intermixing.
- .4 Reject intermixed or contaminated materials. Remove and dispose of rejected materials as directed within 48 hours of rejection.
- .5 Stockpile materials in uniform layers of thickness as follows:
  - .1 Max 1 m for coarse aggregate and base course materials.
  - .2 Max 2 m for fine aggregate and subbase materials.
  - .3 Max 1.5 m for other materials.
- .6 Complete each layer over entire stockpile area before beginning next layer.
- .7 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .8 Coning of piles or spilling of material over edges of pile will not be permitted.
- .9 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

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PART 1 - GENERAL

- 1.1 Description of Work This Section includes but is not limited to the following:
- .1 All normal removals as required to complete the work. All items to be verified by a site visit prior to submission of a tender. All available plans of the existing structure are available for viewing at the Project Manager's office, 2nd floor, 1713 Bedford Row, Halifax, N.S.
  - .2 Any derricks, gas lines or buildings to be removed by others unless otherwise indicated.
  - .3 Removal of material for 0.5 metres below the harbour bottom to provide a toe in for the rip rap slope protection as shown on the plans and specifications.
- 1.2 Related Work
- .1 Refer to other specification sections for related information.
  - .2 Refer to **Section 01 33 00** for Shop Drawing/Submission requirements.
- 1.3 Submissions
- .1 Methodology:
    - .1 When requested provide methodology for carrying out the work
  - .2 Provide submission in accordance with **Section 01 33 00**.
- 1.4 Protection
- .1 Prevent movement, settlement or damage of adjacent structures. Provided bracing and shoring as required. In event of damage, immediately replace such items or make repairs to approval of *Departmental Representative* and at no additional cost to *Departmental Representative*.
  - .2 Prevent debris from going adrift and becoming a menace to navigation.
  - .3 All damage to existing structures, roadways, pipelines, electrical systems not specified
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for removal to be repaired at the Contractor's cost to the satisfaction of the *Departmental Representative*.

1.5 Measurement for Payment

- .1 Sitework, demolition and removals will be measured in accordance with **Section 01 29 00**.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Preparation

- .1 Inspect site and verify with *Departmental Representative* items designated for removal and items to be preserved.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
- .3 Provide temporary power and lighting as shown on the plan or as required by the *Departmental Representative*.
- .4 Existing fill and vent pipes, oil waste tanks and underground storage tanks to be protected from any damages. All repairs to damages as a result of Contractor's operations to be at his cost and to the satisfaction of the *Departmental Representative*.

3.2 Disposal of Material

- .1 Refer to Environmental Protection **Section 01 35 44** for supplementary information.
- .2 Disposal of materials not designated for salvage or re-use in work, will be the contractor's responsibility, and must be disposed of off-site.
- .2 The material to be disposed is to be transported and disposed of in an environmentally acceptable manner to the satisfaction of the *Departmental Representative*, and in accordance with any

local, Municipal, Provincial and Federal restrictions and regulations.

- 3.3 Restoration
- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.
  - .2 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work. Match condition of adjacent, undisturbed areas.
-

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- 1.2 Reference Standards .1 ASTM D698-91 (or latest edition) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) - Method C.
- 1.3 Measurement for Payment .1 Granular sub-base, including compaction, will be measured in accordance with Section 01 29 00.
- .2 Cost to include regrading of gravel on entire existing service area and access road to groyne, upon completion of work.

PART 2 - PRODUCTS

- 2.1 Materials .1 Granular sub-base material to Section 31 05 17 and following requirements:
- .1 Crushed stone or gravel consisting of hard durable angular particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Type 2 (previously Class 'C') granular material gradation will be within the following limits:

ASTM SIEVE SIZE		% PASSING BY MASS
56	mm	100
28	mm	60 - 80
5	mm	25 - 45
0.160	mm	0 - 10

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**PART 1 - GENERAL**

- 1.1 Description
- .1 The site of the work is Cripple Creek Shelburne County, Nova Scotia. Area to be dredged is shown on plan.
  - .2 This section specifies requirements for excavating underwater materials in areas and to dimensions and coordinates indicated on plan, and for transporting and disposing of excavated materials to specified locations.
- 1.2 Related Work
- .1 Refer to Environmental Protection **Section 01 35 44** for related information.
- 1.3 Definitions
- .1 Dredging: excavating, transporting and disposing of underwater materials as specified.
  - .2 Class "A" Material: boulders or concrete debris with each unit containing 3.0 cubic metres or more, and solid rock requiring drilling and blasting or hydraulic splitting to loosen.
  - .3 Obstruction: material other than Class "A", having individual volumes of 3.0 cubic metres or more.
  - .4 Class "B" Material: loose or shale rock, sand, quick sand, mud, shingle, clay and sand, gumbo, hardpan, clay, marine clay, clay sizes, marine silt, silt and gravel, gravel, cobbles, marine shells, or any other materials not defined under Class "A" material.
  - .5 Debris: pieces of wood, wood chips, bark, logs, submerged logs, tree branches, scrap vehicle tires, concrete, steel cable, steel chain, wire rope, scrap steel, etc.
  - .6 CMPM: cubic metres place measurement.
  - .7 Grade: plane or planes above which all material is to be dredged.
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- .8 Estimated Quantity: volume in cubic metres calculated to be above dredge grade and within specified side slopes unless otherwise specified.
  - .9 U.T.M. Coordinates: Universal Transverse Mercator plan rectangular grid system to be used for all horizontal control of dredging operations as indicated on plan. (NAD 83 Zone 20)
  - .10 Matrix Block: each block area is presented as a number of 1.2 X 3.0 m long blocks. Dependent on the position of the sounding a block may have 1 to 4 sounding contained within it. A blank Matrix Block will indicate that no sounding was registered for that matrix.
  - .11 Minimum Mode: a mode of operation of hydrographic survey equipment where the minimum sounding over the length of travel between position updates will be retained in memory.
  - .12 Least of Minimum Plan: a hydrographic survey plan in which the least sounding in that matrix block is plotted.
  - .13 Instantaneous Mode: a mode of operation of hydrographic survey equipment where only the sounding observed at a predetermined distance interval is retained in memory.
  - .14 Average of Instantaneous Plan: a hydrographic survey plan in which the average of instantaneous soundings in that matrix block is plotted.
  - .15 Side Slope: inclined surface or plane from grade at side limit of dredging area to intersect original ground line outside of side limit and to be expressed as a ratio of horizontal to vertical. All material above side slopes is to be dredged.
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**PART 1 - GENERAL**

- 1.1 Description
- .1 The site of the work is Cripple Creek Shelburne County, Nova Scotia. Area to be dredged is shown on plan.
  - .2 This section specifies requirements for excavating underwater materials in areas and to dimensions and coordinates indicated on plan, and for transporting and disposing of excavated materials to specified locations.
- 1.2 Related Work
- .1 Refer to Environmental Protection **Section 01 35 44** for related information.
- 1.3 Definitions
- .1 Dredging: excavating, transporting and disposing of underwater materials as specified.
  - .2 Class "A" Material: boulders or concrete debris with each unit containing 3.0 cubic metres or more, and solid rock requiring drilling and blasting or hydraulic splitting to loosen.
  - .3 Obstruction: material other than Class "A", having individual volumes of 3.0 cubic metres or more.
  - .4 Class "B" Material: loose or shale rock, sand, quick sand, mud, shingle, clay and sand, gumbo, hardpan, clay, marine clay, clay sizes, marine silt, silt and gravel, gravel, cobbles, marine shells, or any other materials not defined under Class "A" material.
  - .5 Debris: pieces of wood, wood chips, bark, logs, submerged logs, tree branches, scrap vehicle tires, concrete, steel cable, steel chain, wire rope, scrap steel, etc.
  - .6 CMPM: cubic metres place measurement.
  - .7 Grade: plane or planes above which all material is to be dredged.
-

- 
- .8 Estimated Quantity: volume in cubic metres calculated to be above dredge grade and within specified side slopes unless otherwise specified.
  - .9 U.T.M. Coordinates: Universal Transverse Mercator plan rectangular grid system to be used for all horizontal control of dredging operations as indicated on plan. (NAD 83 Zone 20)
  - .10 Matrix Block: each block area is presented as a number of 1.2 X 3.0 m long blocks. Dependent on the position of the sounding a block may have 1 to 4 sounding contained within it. A blank Matrix Block will indicate that no sounding was registered for that matrix.
  - .11 Minimum Mode: a mode of operation of hydrographic survey equipment where the minimum sounding over the length of travel between position updates will be retained in memory.
  - .12 Least of Minimum Plan: a hydrographic survey plan in which the least sounding in that matrix block is plotted.
  - .13 Instantaneous Mode: a mode of operation of hydrographic survey equipment where only the sounding observed at a predetermined distance interval is retained in memory.
  - .14 Average of Instantaneous Plan: a hydrographic survey plan in which the average of instantaneous soundings in that matrix block is plotted.
  - .15 Side Slope: inclined surface or plane from grade at side limit of dredging area to intersect original ground line outside of side limit and to be expressed as a ratio of horizontal to vertical. All material above side slopes is to be dredged.
-

- 
- .16 Cleared Area: a dredge area that has been accepted by the *Departmental Representative* as complying with plans and specifications and all material removed to grade.
  - .17 Box Cut: dredging and letting the side of the excavation collapse, where possible, to an equilibrium slope.
  - .18 Chart Datum: by international agreement, a plane below which the tide will seldom fall. The Canadian Hydrographic Services has adopted the plane of Lowest Norman Tide (LNT) as Chart Datum. As the rise, fall and ranges of tides varies daily, The Canadian Hydrographic Services should be consulted for tidal prediction and other tidal information relating to the work.
  - .19 Dredging Area: a rectangle or polygon, defined by coordinates in which dredging is to take place.
- 1.4 Location
- .1 Contract drawings indicate those areas which required dredging at the time of the most recent surveys. Actual extent of dredging within the areas may vary slightly from those indicated on the drawings.
- 1.5 Schedule of Work
- .1 Submit to *Departmental Representative*, within 5 working days after award of Contract, a schedule of work including time periods during which each operation involved in the work will be undertaken. Also submit an estimated monthly dredging production of material in square metres for each operation.
  - .2 Include in the above schedule of work a list of buoys which interfere with the progress of this work. Coordinate with the *Departmental Representative* arrangements to be made to relocate these buoys to avoid unnecessary delay.
  - .3 Adhere to the schedule and take immediate action to correct any slippage by effectively altering existing dredging operations or
-

mobilizing other equipment. The *Departmental Representative* is to be notified of the corrective action to be taken.

1.6 Interference  
to Navigation

- .1 Be familiar with activities at dredging sites and vessel movements in areas affected by dredging operations.
- .2 Plan and execute work in a manner that will not impede navigation including movement of vessels in the channel, at any wharf site being dredged, or any other boat traffic at adjacent wharves in the harbour.
- .3 Plan and execute work in a manner that will not interfere with activities at wharf sites, or access to wharves by land or water.
- .4 The *Departmental Representative* will not be responsible for loss of time, equipment, material or any other charges related to interference with vessels in the harbour, weather conditions, or due to other Contractor's operations.
- .5 Prior to any removal/reinstallation of navigational aids/buoys, contact Canadian Coast Guard in Charlottetown at 1-902-566-7936, Attention: Claire MacClaren.
- .6 Keep Canadian Coast Guard informed of dredging operations, in order that necessary Notices to Shipping can be issued.
- .7 Be responsible for damage to buoys or other navigation markers cause by dredging operations. If such occurs, notify Canadian Coast Guard. Assume responsibility for replacement or repairs.

1.7 Interface to  
Fishery Operations  
and Damage to  
Fishing Gear

- .1 Become familiar with fishery activities. Clearly mark dredging area, disposal areas and routes to and from dredging and disposal areas during periods when fishing gear is set in areas adjacent to dredging operations with "Cautionary Buoys" in accordance with Coast Guard Standard TP968 (<http://www.ccg-gcc.gc.ca/folios/00020/docs/CanadianAidsNavigationSystem2011-eng.pdf>). All buoys must be coloured cautionary yellow - CGSB # 505-108, and be equipped with radar reflectors.

Be responsible for all costs associated with the supply, installation and removal of all necessary temporary aids. The Contractor will receive approval from the District Fisheries Officer for the location of the buoys, upon review and acceptance of temporary aids by the *Departmental Representative*.

Keep Canadian Coast Guard informed of buoyed corridors in order that necessary Notices to Shipping can be issued.

- .2 Execute the work to ensure damage does not occur to fishing gear and interference to fishing operations is minimized by conducting operations within the areas so marked.
- .3 Be responsible for damage to fishing gear outside marked areas, if as a result of dredging activities, and if damage occurs, assume responsibility for replacement or repair costs and cost of lost fishing opportunity.

1.8 Requirements  
of Regulatory  
Agencies

- .1 Perform work in accordance with the National Building Code of Canada (NBC) and any other municipal, provincial and/or national codes relating to the project. In any case of

conflict or discrepancy, the more stringent requirements will apply.

- .2 Meet or exceed requirements of specified standards, codes and referenced documents.
- .3 Mark floating equipment with lights in accordance with Regulations for the Prevention of Collisions, as required by Transport Canada.
- .4 Contractor will be required to obtain prior approval from applicable regulatory agencies for any dredging outside specified dredging limits.

1.9 Floating Plant

- .1 Dredges or other floating plants which are to be employed on this work, must be of Canadian registry, and make or manufacture.
- .2 Dredges or other floating plant not of Canadian make or manufacture must receive a certificate of qualification from Industry Science and Technology Canada and this certificate must accompany tender submission.
- .3 Requests for certification in format of attached questionnaire must be directed to Acting Director, Ship Building Directorate, Ship Building Marine and Land Defence Systems Branch, Industry, Science and Technology Canada 235 Queen Street, Ottawa, Ontario, KIA 0H5, and must be received there not less than 14 days prior to tender closing.
- .4 Plant qualified by Industry, Science and Technology Canada may be accepted on this dredging project.

1.10 Datums

- .1 Horizontal Datum: All horizontal coordinates used in this specification and contact drawings are in metres referenced to U.T.M. projection based on the North American Datum, 1983, (NAD83, Zone 20). Survey control monuments and their coordinate values are shown on Plan. Additional coordinate monument locations and values can be obtained

from Land Registration and Information Service (L.R.I.S.), Surveys and Mapping Division, 780 Windmill Road, Dartmouth, Nova Scotia, B3J 3C4, Phone: (902) 424-4083.

- .2 Vertical Datum: All elevations and soundings used in this specification and contract drawings are in metres referenced to Chart Datum. For purposes of this contract see Section 3.1.6 for tidal data information.

1.11 Inspection of Site

- .1 The Contractor should visit the site of the work before tendering and make himself thoroughly familiar with the extent and nature of the work and all conditions affecting the work.

1.12 Site Information

- .1 Results of soil borings and soil investigations may be available for inspection at offices of Public Works and Government Services Canada, PO Bo 2247, 1713 Bedford Row 2nd Floor, Halifax, NS B3J 3C9.
- .2 The contractor will be responsible for making his own interpretation of soil conditions at any location, other than sampling locations, Descriptions shown on the logs are only descriptive of conditions at locations described by the boreholes themselves.
- .3 Results of the pre-dredging soundings are shown on the contract drawings. It should be noted that this information may differ from present site conditions.

The Contractor should take this into consideration when submitting his tender.

- .4 It is anticipated that the following materials will be encountered within the dredging limits, but are not limited to:

Class "B" Materials in all areas

- .5 The Contractor shall take the necessary steps to become fully familiar with potential

inclement weather and sea conditions in this area.

1.13 Dredging  
Equipment

- .1 Determine the equipment required to dredge the area and material specified.
- .2 Provide suitable lighting on the dredge for free movement of *Departmental Representative* to inspect work in progress during night dredging operations. Lighting to illuminate all walkways, ladders etc. to safely permit inspection of dredging operation.
- .2 The physical description of materials, as described in **Appendix "C"** (Marine Sediment Sampling Program), is based on small samples and is not necessarily indicative of the overall soil conditions.
- .3 On request, prove to the satisfaction of the *Departmental Representative* that the dredging equipment and plant are adequate to finish the work to quality, time and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
- .4 Contractor shall be responsible for ensuring that equipment can access and function at the disposal site.

1.14 Survey  
Requirements

- .1 The Contractor shall provide, at his expense, a survey vessel, equipment and crew to set up and maintain survey control for the location of the dredge and dredge limits and to sound areas immediately after dredging to verify that grade depth has been attained. Areas are to be sounded with adequate coverage to provide a bathymetric printout of at least a 5 metre spacing on a UTM grid to the approval of the *Departmental Representative*. A copy of the Contractor's positioning and sounding records shall be provided to the *Departmental Representative*.

1.15 Sequence of  
Acceptable Work

- .1 Pre-dredge and post-dredge surveys will be conducted by PWGSC using electronic survey equipment sounding in the instantaneous mode. Sounder will be the Ross sounder sweep system using a 190-210 kHz transducer frequency positioned by DGPS Trimble R7 system. The results will be shown on survey plan at scale of 1:500 plotting average of instantaneous depths. Other survey procedures may be approved by the *Departmental Representative*.
- .2 A pre-dredge survey will be carried out by PWGSC prior to commencement of dredging work by the contractor. The dredge area may be revised by the *Departmental Representative*.
- .3 No area will be dredged prior to *Departmental Representative* and Contractor's mutual acceptance of the pre-dredge survey for that area.
- .4 Post-dredge survey will be undertaken by the Contractor upon completion of dredging of all areas identified in pre-dredge survey. Submit results as indicated in item 1.14 above. Only when this survey shows that all soundings are at or below grade that the *Departmental Representative* will do a post-dredge survey. The survey will use the same type of equipment as used in the pre-dredge survey. It will be subject to weather conditions and the availability of functional survey equipment. The survey will confirm if dredging is completed as specified. Survey will be by electronic sweep equipment sounding in instantaneous mode. Survey plan at 1:500 scale plotting the average of instantaneous depths obtained in this survey will identify areas requiring reworking to obtain the elevation as specified in contract to below Chart Datum.

The Contractor will redredge as necessary to remove all material within the dredge areas which is found to be above the average of

instantaneous elevations as specified on post dredge survey drawings.

.5 All additional surveys required to clear the dredge area will be undertaken by the *Departmental Representative* at Contractor's cost.

.6 All surveys will be performed to Canadian Hydrographic Service Standards.

1.16 Measurement  
for Payment

.1 Dredging and removals will be measured in accordance with **Section 01 29 00.**

.2 The dredge areas are defined by coordinates and dimensions, as shown on the drawings.

.3 For the purpose of quantity computation, existing seabed elevation will be represented by and "Average of Instantaneous" sounding for each matrix block of the pre-dredge survey performed by the *Departmental Representative* as soon as practical after contract award. Post dredging elevations for quantity computations will be: (1) grade, or (2) the "Average of Instantaneous" sounding for each matrix block of the postdredge survey, whichever is shallower. The method of calculation and the quantity of material removed for measurement for payment will be determined by the *Departmental Representative*.

.4 No payment will be made for the Contractor's survey vessel, equipment and crew or diving services.

.5 All operations in connection with the field positioning of dredging equipment will be considered incidental to the work and will not be measured separately for payment.

.6 Payment for dredging shall include the disposal of dredge material, at location and in manners specified.

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- .7 There will be no additional payment for temporary structures used in dredging operations.
  - .8 There will be no additional payment for delays caused by fishing seasons.
  - .9 There will be no additional payment for delays caused by vessel traffic.
  - .10 There will be no additional payment for down time, mechanical or weather-related.
  - .11 There will be no additional payment for delays caused by navigational buoys in dredge areas.
  - .12 Once designated areas have been dredged and cleared, all subsequent infilling shall be deemed as additional to the contract if removal is required.
  - .13 Removal of material infilling during dredging will not be measured separately for payment.
  - .14 There will be no additional payment for land disposal of debris not suitable for the disposal site.
  - .15 There will be no additional payment for berthing or mooring facilities for the dredge plant or any other floating equipment.
  - .16 The entire area of each site, at all sites, as shown on the plan, shall be fully covered during dredging.
  - .17 There will be no additional payment for side slopes as they are considered incidental to this contract.
  - .18 There will be no additional payment for delays or changes in dredging methods required as a result of water quality monitoring results.
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PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 General

- .1 The Contractor shall do the following in executing the work:
- .1 Mark floating equipment with lights in accordance with International Rules of Road and maintain a radio watch on board.
  - .2 Place and maintain buoys, ranges, markers and lights required to define work. The *Departmental Representative* will provide the coordinate values for all dredge limits on the drawings.
  - .3 Maintain and lay out work form bench marks and control points as shown on Plan and noted in the Specifications. Any additional control points and tidal reference stations required to control dredging operations are the responsibility of the Contractor. The Contractor is to maintain these control points and tidal reference stations for the duration of the project and at the Contractor's cost.
  - .4 For accurate dredge control, the Contractor is to provide and maintain on the dredge electronic position fixing and distance measuring equipment with associated computer software capable of providing a printout showing dredge position. Equipment is to provide a continuous coordinated position of the dredge in the U.T.M. Coordinate Grid System with an accuracy of  $\pm 3.0$  metres or less.
  - .5 All survey equipment provided on the dredge by the Contractor is to be made accessible to the *Departmental Representative* for his use.
-

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- .6 Establish accurately and maintain water level gauges or tide boards in order that proper depth of dredging can be determined. Locate gauges so as to be clearly visible at all times.

The Contractor is to provide a tidal monitoring system to read and record the tide level at a maximum of 15 minute intervals. These records are to be made available for the inspection and use of the *Departmental Representative*. If using an electronic tide gauge, the Contractor must check the accuracy of the gauge daily. The gauge must be accurate to  $\pm 2$  cm. The monitoring system is to be approved by the *Departmental Representative*.

- .7 Dredge areas to grade depths below Chart Datum where indicated on the drawing.
- .8 Dredge all side slopes to one and half (1.5) horizontal to one (1) vertical unless otherwise noted.
- .9 Remove all materials above specified grade depth and side slopes, within limits indicated. Material removed from below grade depth or outside specified area or side slope is not part of work and will not be measured.
- .10 Remove shoaling which occurs as a result of the work at no expense to *Departmental Representative*.
- .11 Remove material cast-over onto surrounding area and dispose of it as dredged material at Contractor's expense. Casting over of material is not permissible unless authorized by the *Departmental Representative*.
- .12 The Contractor is responsible for the removal of infilling in dredge areas
-

which occurs prior to acceptance by the *Departmental Representative*.

- .13 It will be the Contractor's responsibility to gain access to the dredge area. The construction of causeways, roads, etc., will be at the Contractor's expense and will be removed at the completion of the project. It will be the contractors responsibility to obtain all environmental approvals associated with the construction of temporary access roads to complete the dredging. Any derricks, power lines, etc., which will require removal will be done so at the Contractor's expense and will be replaced to satisfaction of the *Departmental representative*. Contractor to advise *Departmental representative* of his proposed method to carry out dredging and disposal of the material.
- .14 Immediately notify the *Departmental Representative* upon encountering any object which might be classified as an obstruction. By-pass the object, after clearly marking its location by coordinates and continue work.
- .15 Provide dump scows capable of maintaining dredge materials within hoppers until delivery to disposal site. The *Departmental Representative* has the right to order removal of dump scows from the site where leakage from the dump scows is deemed to be excessive.
- .16 Arrange and pay for berthing and mooring facilities for dredge plant and other floating equipment.
- .17 Dredging operations are not to undermine the existing wharf or breakwaters.

Protect existing structures during dredging operations. Ensure the shore protection slope is not disturbed.

Contractor will be responsible for repairs to the slope protection should damage occur.

The contractor will be responsible for establishing a temporary offloading structure for removal of the dredge material. The use of any existing wharf structures which are the property of the Dept. Of Fisheries and Oceans, will not be permitted.

- .18 Contractor must take all precautions to prevent damage to the wharf structure.

3.2 Encountering  
Class "A"  
Material

- .1 Identify areas where Class "A" material is encountered above specified dredge grade, work equipment, which may require the use of toothed buckets, over areas to remove all Class "B" material, until *Departmental Representative* is satisfied that further removal cannot be accomplished without blasting. Immediately identify these areas with UTM coordinates, and provide information to *Departmental Representative*.

3.3 Existing  
Navigation Buoys

- .1 The Contractor will make arrangements with Canadian Coast Guard for the removal and reinstallation of the existing buoys, as required to carry out the dredging operations.

3.4 Disposal of  
Dredge Materials

- .1 Refer to Environmental Protection **Section 01 35 44 11** 1.6 Disposal of Dredged Material

The Contractor shall dispose of dredged material by depositing in the disposal area as identified in the Environmental Protection Section **01 35 44** and in such a manner as approved by *Departmental Representative*.

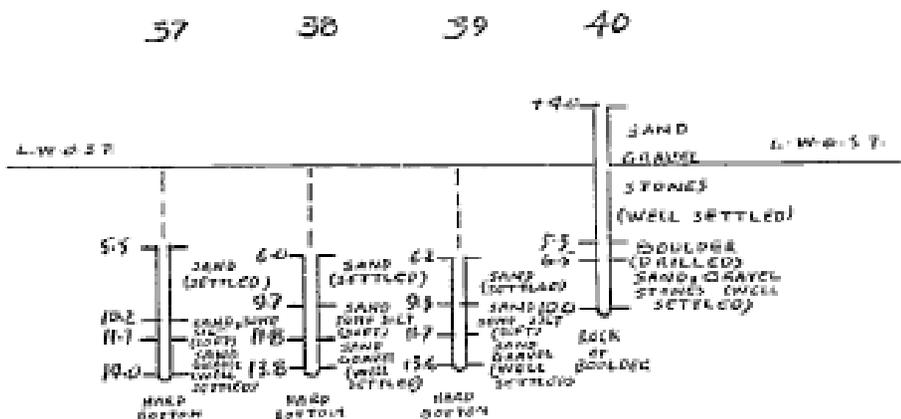
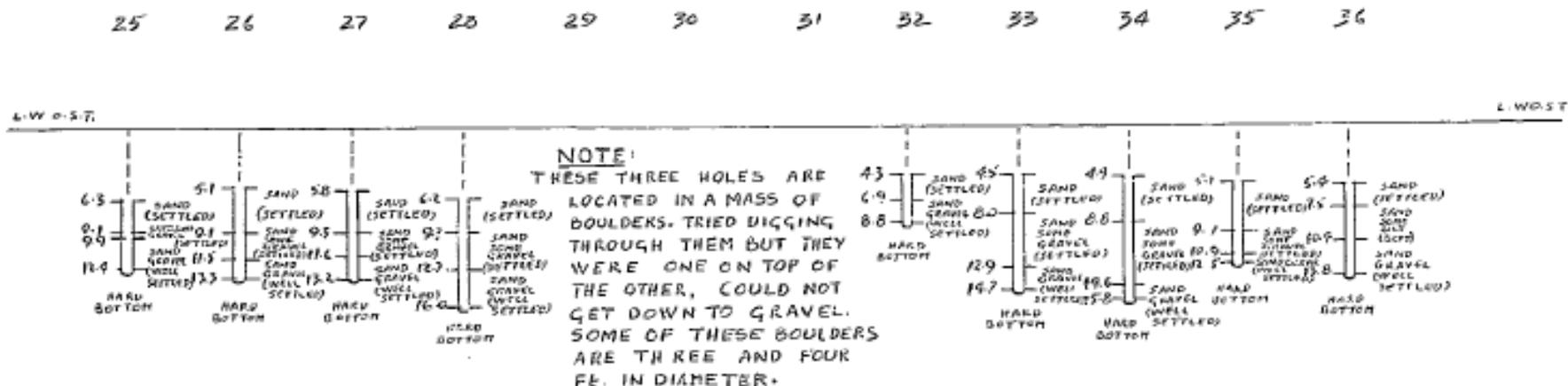
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- .2 All materials deposited on private or public roads or properties in vicinity of site or as a result of trucking material to dump site will be removed by Contractor to satisfaction of owners involved at no additional cost to Department.
  - .3 The Contractor shall take notice that materials to be dumped will consist of all types of Class "B" material, boulders, and debris.
  - .4 The contractor shall ensure that trucks used in the transportation of spoils are road worthy and have tight fitting gates to prevent spoils spills on the road. Trucks not meeting this criteria may be removed from the project by the *Department representative*.
  - .5 Clean truck boxes and wheels of dredge spoils before moving onto provincial roads. Vehicle wash down stations may be required at both the loading and offloading sites to ensure the above requirements are met.
  - .6 Timber, logs and cable must not be disposed of at the disposal sites. This debris must be disposed of at an appropriate landfill other than the designated disposal sites. This debris and its disposal will not be measured for payment but is incidental to dredging.
  - .7 Ocean Disposal of dredge material is not permitted.
  - .8 The contractor will be responsible for establishing a temporary offloading site for removal of the dredge material. The local harbour authority contact will provide direction with respect to an acceptable location on the existing structures or within the harbour limits.
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Appendix "A" - 1953 Boreholes

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Borehole Logs 25-40 (measured in ft)



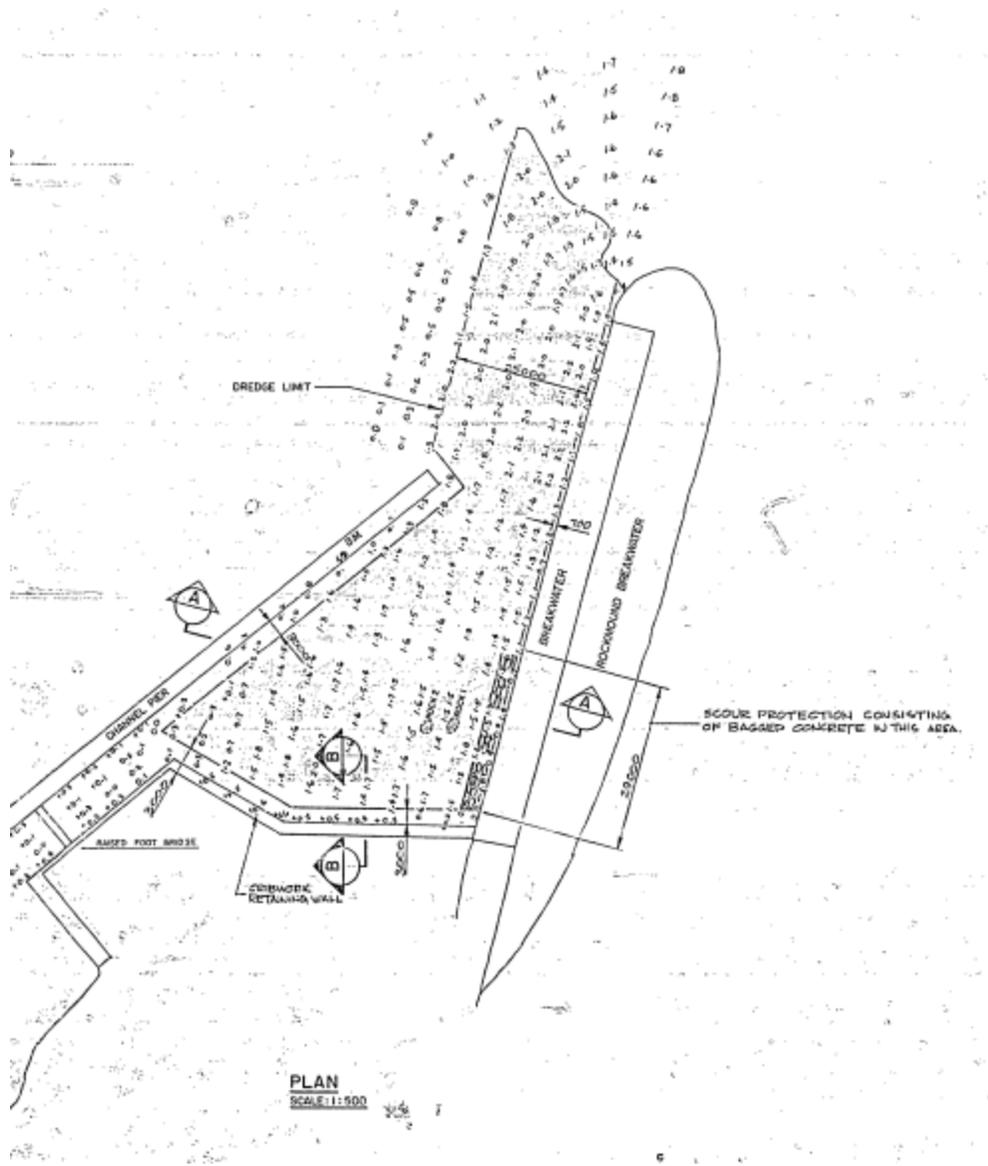
Appendix "B" - Historical Dredge Surveys

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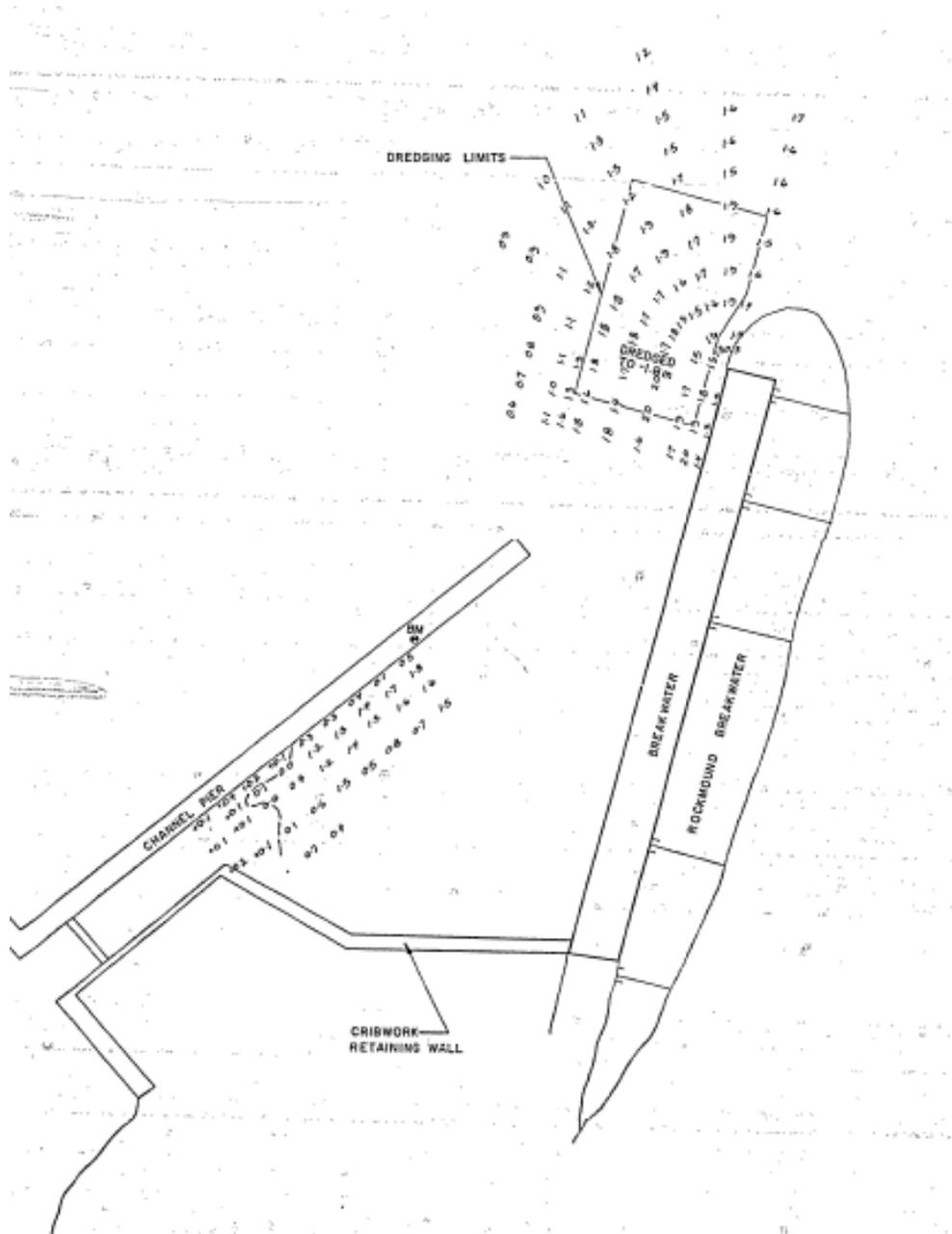




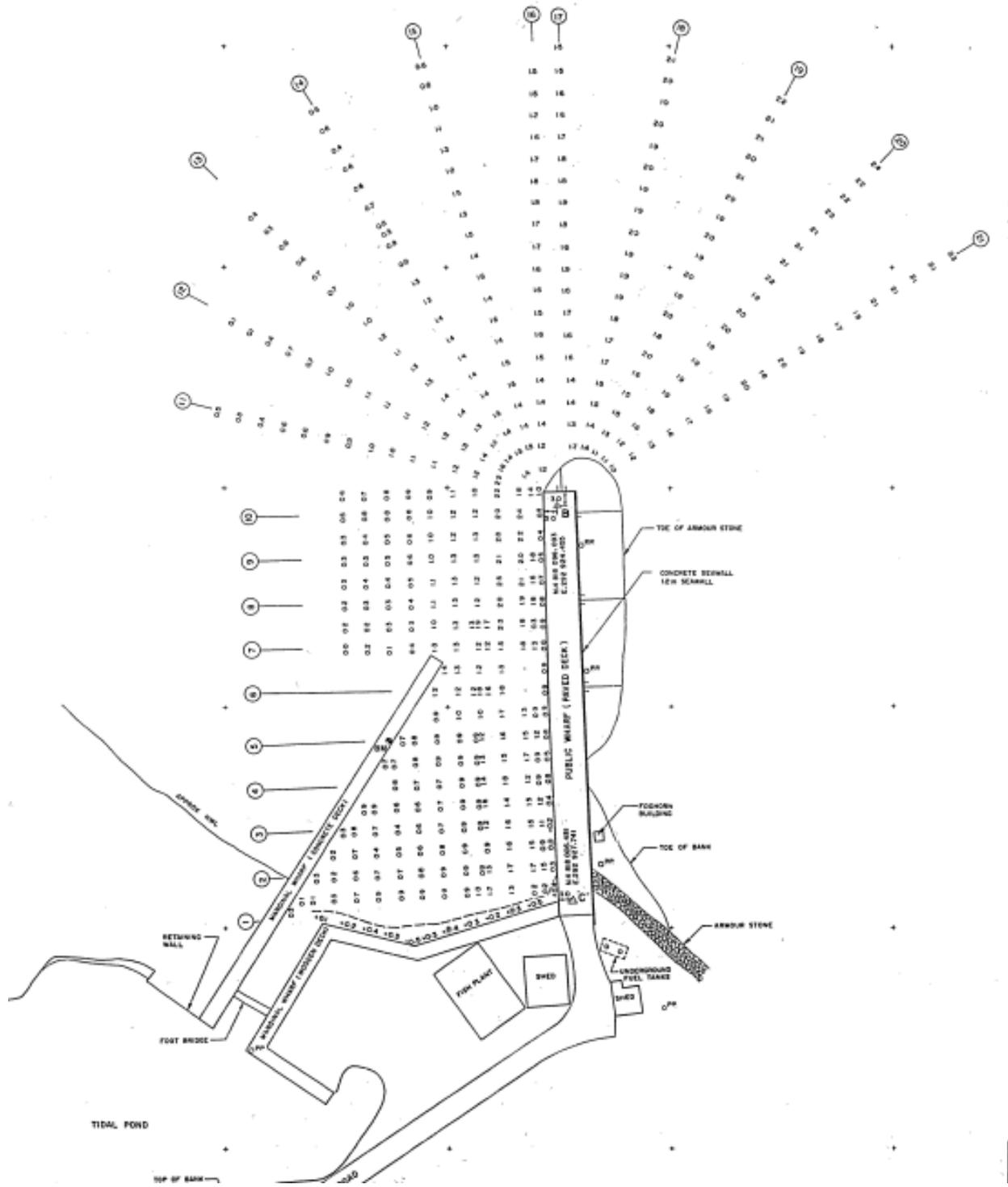
1985 Post Dredge Survey



1987 post Dredge Survey



1989 Post Dredge Survey



Appendix "C" - Marine Sediment Sampling Report  
(Stantec 2015)

**Final Report - Marine Sediment  
Sampling Program: Cripple  
Creek DFO-SCH, Shelburne  
County, Nova Scotia**

PWGSC RISO No. E0225-  
1333442/002/PWD  
Stantec Project #121413541



Prepared for:  
Public Works and Government  
Services Canada

Prepared by:  
Stantec Consulting Ltd.

September 4, 2015

## Sign-off Sheet

This document entitled Final Report - Marine Sediment Sampling Program: Cripple Creek DFO-SCH, Shelburne County, Nova Scotia was prepared by Stantec Consulting Ltd. for the account of Public Works and Government Services Canada. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



Prepared by \_\_\_\_\_  
(signature)

**Jennifer Randall, Environmental Scientist**



Reviewed by \_\_\_\_\_  
(signature)

**Don Carey, National Technical Leader, Site Investigation & Remediation**

**FINAL REPORT - MARINE SEDIMENT SAMPLING PROGRAM: CRIPPLE CREEK DFO-SCH,  
SHELburne COUNTY, NOVA SCOTIA**

September 4, 2015

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# FINAL REPORT - MARINE SEDIMENT SAMPLING PROGRAM: CRIPPLE CREEK DFO-SCH, SHELburnE COUNTY, NOVA SCOTIA

September 4, 2015

## Abbreviations

AO	Aesthetic Objective
BTEX	Benzene, Toluene, Ethylene, Xylene
CCME	Canadian Council of Ministers of the Environment
CEPA	<i>Canadian Environmental Protection Act</i>
COC	Chain of Custody
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DFO	Fisheries and Oceans Canada
EPA	Environmental Protection Agency (United States)
FAL	Guidelines for the Protection of Freshwater Aquatic Life
FID	Flame Ionization Detector
IACR	Index of Additive Cancer Risk
ISQG	Interim Sediment Quality Guideline
MAC	Maximum Acceptable Concentration
MSSP	Marine Sediment Sampling Program
NS EQS	Nova Scotia Environmental Quality Standards
PAH	Polycyclic Aromatic Hydrocarbon
PEF	Potency Equivalence Factor (of Benzo[a]pyrene)
PEL	Probable Effects Level
PWGSC	Public Works and Government Services Canada
RBCA	Risk-Based Corrective Action
RBSL	Risk-Based Screening Level
SCC	Standards Council of Canada
SPLP	Synthetic Precipitation Leaching Procedure
SQG	Soil Quality Guideline
TPE	Total Potency Equivalent
TPH	Total Petroleum Hydrocarbon
UF	Uncertainty Factor
WQG	Water Quality Guideline

# FINAL REPORT - MARINE SEDIMENT SAMPLING PROGRAM: CRIPPLE CREEK DFO-SCH, SHELBURNE COUNTY, NOVA SCOTIA

September 4, 2015

## Executive Summary

Ten sediment samples were collected on June 23, 2015 in Cripple Creek Harbour by ISO 9001 certified SCUBA divers and submitted to Maxxam Analytics laboratory for detailed physicochemical analyses. Seven different types of analysis were completed. The results for each were compared to a variety of guidelines. Table ES-1 provides a summary of the results of six analyses (listed in the top row) and the guidelines to which they were compared. Comparisons are indicated with a black dot.

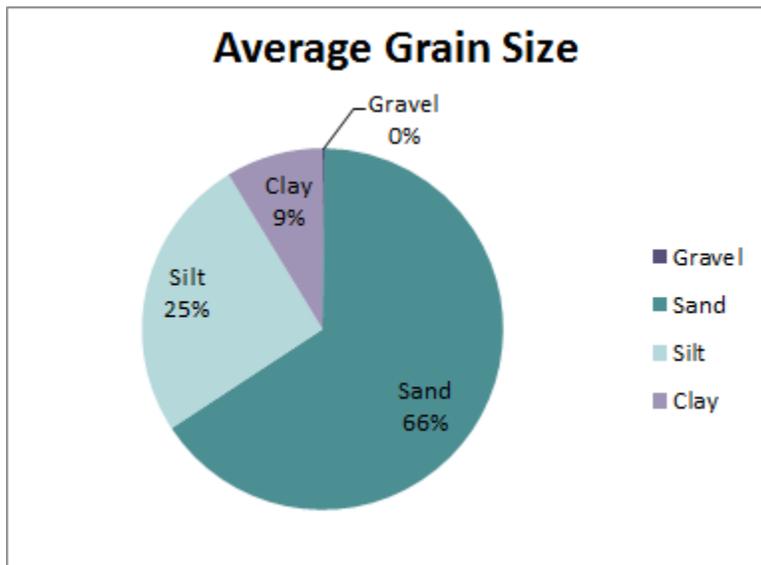
**Table ES-1.1 Matrix indicating which guidelines were used for comparison for each type of analytical results**

Parameters Guidelines	PAH	PAH Leachate	Metals	Metals Leachate	BTEX-TPH	PCBs, DDT & PCP
Canadian Environmental Protection Act (CEPA) Disposal at Sea Screening Criteria	•		•			•
CCME Soil Quality Guidelines (SQGs) for the Protection of Human and Environmental Health	•		•		•	•
Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills	•	•	•	•	•	•
Nova Scotia Environmental Quality Standards	•	•	•	•	•	•
CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life		•		•		
CCME Canadian Water Quality Guidelines for the Protection of Agriculture				•		
Health Canada Guidelines for Canadian Drinking Water		•		•		
Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 3.0					•	

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Grain size analysis revealed that the sediment samples were composed primarily of sand, with varying levels of silt. The average grain size composition of the sediment samples is shown in Figure ES-1. Eight of the ten samples contained greater than or equal to 50% sand. The predominant form of carbon was organic carbon (TOC).



**Figure ES-1.1 Average sediment grain size distribution for Cripple Creek Harbour**

Analysis of the Cripple Creek sediment samples resulted in a variety of exceedances for a several parameters. All guidelines listed in table ES-1 were exceeded by at least one parameter. In terms of disposal guidelines, the sediment samples exceeded the guidelines for both Disposal at Sea (CEPA), and Disposal of Contaminated Solids in Landfills in Nova Scotia. The results of PAH analysis had a particularly high level of exceedances. Upon identification of PAH exceedances, leachate analysis was conducted on CC-1, CC-2, CC-11, CC-12 and Composite A. All five of these leachate samples exceed the NSEQS for surface water.

Metals also had a high level of exceedances, and all ten samples exceeded the NS Guidelines for Disposal of Contaminated Solids in Landfills and the NS EQS. Based on those results, CC-2, CC-11 and CC-12 were submitted for leachate analysis. These all exceeded the Health Canada Guidelines for Canadian Drinking Water, the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life and the NS EQS for surface water. Table ES-2 summarizes all exceedances for each of the ten samples.

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**Table ES-1.2 Guidelines and parameters exceeded in Cripple Creek Sediment Samples.**

Guideline	Sample ID									
	CC-1	CC-2	CC-9	CC-10	CC-11	CC-12	CC-13	CC-14	Composite A	Composite B
PAH – CEPA Disposal at Sea Screening Criteria	•	•			•	•			•	
PAH -CCME Soil Quality Guidelines: Human Health (including IACR index)	•	•	•	•	•	•			•	
PAH - CCME Soil Quality Guidelines: Environmental Health	•	•			•	•			•	
PAH - Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills										
PAH - Nova Scotia Environmental Quality Standards - Soil										
PAH - Nova Scotia Environmental Quality Standards – Sediment					•	•				
PAH SPLP Leachate – CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life in Freshwater	•	•			•	•			•	
PAH SPLP Leachate- CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life in Marine Environments										
PAH SPLP Leachate – Health Canada Guidelines for Canadian Drinking Water										
PAH SPLP Leachate – Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills										
PAH SPLP Leachate – NSEQS Surface Water (Freshwater) guidelines	•	•			•	•			•	
PAH SPLP Leachate – NSEQS Surface Water (Marine) guidelines	•	•			•	•			•	
PAH SPLP Leachate – NSEQS Groundwater guidelines										
Metals - CEPA Disposal at Sea Screening Criteria						•				

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**Table ES-1.2 Guidelines and parameters exceeded in Cripple Creek Sediment Samples.**

Guideline	Sample ID									
	CC-1	CC-2	CC-9	CC-10	CC-11	CC-12	CC-13	CC-14	Composite A	Composite B
Metals - CCME Soil Quality Guidelines: Environment and Human Health		•			•	•			•	
Metals - Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills	•	•	•	•	•	•	•	•	•	•
Metals - Nova Scotia Environmental Quality Standards - Soils	•	•	•	•	•	•	•	•	•	•
Metals - Nova Scotia Environmental Quality Standards – Sediment										
Metals Leachate - Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills										
Metals Leachate - CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater and/or Marine)		•			•	•				
Metals Leachate - CCME Canadian Water Quality Guidelines for the Protection of Agriculture (Irrigation and/or Livestock)										
Metals Leachate - Health Canada Guidelines for Canadian Drinking Water		•			•	•				
Metals Leachate - NSEQS Surface Water (Freshwater and / or Marine) guidelines		•			•	•				
Metals Leachate - NSEQS Groundwater guidelines						•				
BTEX-TPH – Atlantic RBCA Tier 1										
BTEX-TPH- Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life	•	•	•	•	•	•			•	

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**Table ES-1.2 Guidelines and parameters exceeded in Cripple Creek Sediment Samples.**

Guideline	Sample ID									
	CC-1	CC-2	CC-9	CC-10	CC-11	CC-12	CC-13	CC-14	Composite A	Composite B
BTEX-TPH- CCME Soil Quality Guidelines: Surface										
BTEX-TPH- CCME Soil Quality Guidelines: Subsoil										
BTEX-TPH- Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills										
BTEX-TPH- Nova Scotia Environmental Quality Standards: Soils						•			•	
BTEX-TPH- Nova Scotia Environmental Quality Standards: Sediments	•	•	•	•	•	•			•	
PCBs, DDT and PCP - CEPA Disposal at Sea Screening Criteria	•	•		•	•	•			•	
PCBs, DDT and PCP - CCME Soil Quality Guidelines: Human Health (including IACR index)										
PCBs, DDT and PCP - CCME Soil Quality Guidelines: Environmental Health										
PCBs, DDT and PCP - Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills										
PCBs, DDT and PCP - Nova Scotia Environmental Quality Standards - Soil										
PCBs, DDT and PCP - Nova Scotia Environmental Quality Standards - Sediment	•	•		•	•	•			•	•

Note: a dot indicates that the sample had exceedances of one or more of the parameters for the listed analysis.

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## 1.0 Introduction

At the request of Public Works and Government Services Canada (PWGSC), Stantec Consulting Ltd. (Stantec) has undertaken a Marine Sediment Sampling Program (MSSP) for the Cripple Creek DFO-SCH (Fisheries and Oceans Canada Small Craft Harbour). The purpose of the MSSP is to collect and characterize sediment from the harbour prior to dredging, in order to explore disposal options for the dredged sediment. On June 23, 2015, Stantec sampled marine sediments from Cripple Creek DFO-SCH. Sediment samples were collected at 14 locations. Six of these locations had been previously sampled in 2011, and we submitted for analysis as two composites. In total, 10 sediment samples were submitted for physicochemical analysis to an analytical laboratory accredited by the Standards Council of Canada (Maxxam Analytics Inc.). This report describes the sampling program design and methodology, summarizes the analytical results obtained, and compares and interprets the results against relevant criteria. As per the Terms of Reference (TOR) by PWGSC to Stantec, this report only presents the analytical results of sediment quality as compared to relevant criteria and does not explore technical aspects of sediment dredging and disposal options.

## 2.0 SAMPLING DESIGN

### 2.1 SITE PLAN

The selection of sample locations followed guidance provided in Environment Canada's *Users Guide to the Application Form for Ocean Disposal (Report EPS 1/MA/1 December 1995)*, whereby a randomization procedure was implemented for selecting sample locations in the proposed dredging areas of the SCH. A detailed sampling design was prepared by Stantec and submitted to PWGSC for review and approval prior to the implementation of the field program.

Figure 2.1 presents the marine sediment sampling locations at Cripple Creek.

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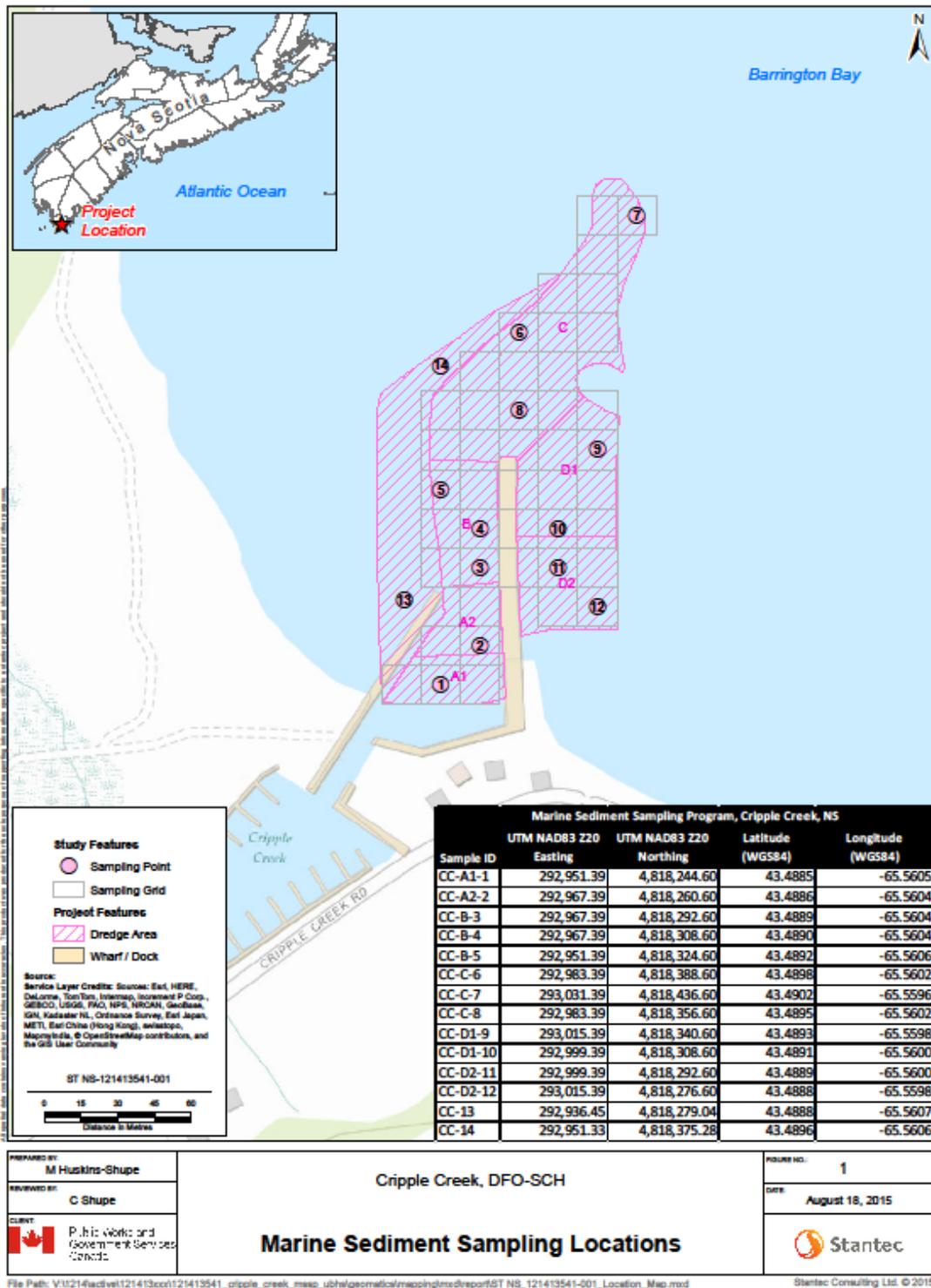


Figure 2.1 Marine Sediment Sample Locations at Cripple Creek DFO-SCH.

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## 2.2 SAMPLE COLLECTION

Sample collection, handling, and transportation were conducted in accordance with Sections 2.5 (Collection of Whole Sediments), 2.7 (Handling of Collected Samples), and 2.8 (Transport and Storage of Field-Collected Sediment Samples) of Environment Canada's *Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing*, December 1994. The field program was completed in accordance with guidelines defined by Nova Scotia's Occupational Health and Safety Standards.

Samples were collected on June 23, 2015. The weather on this day was rainy, with a maximum temperature 14°C. Marine sediment samples were collected from a total of fourteen locations in two dredge areas by ISO 9001 certified SCUBA divers operating from a 16' Boston Whaler, held in position using an anchor and a 75-HP outboard motor. A handheld Garmin Global Positioning System (GPS) with ±3 m accuracy was used to georeference the sample location coordinates (Table 2.1). MSSP field reports were completed in the field during the sampling program and are provided in Appendix A. Fourteen surface (grab) samples. Six of these were taken from areas that were previously sampled in 2011, while the remaining eight samples were taken from new areas.

**Table 2.1 Location of Marine Sediment Samples taken in Cripple Creek, Nova Scotia**

Marine Sediment Sampling Program, Cripple Creek, NS				
Sample ID	UTM NAD83 Z20 Easting	UTM NAD83 Z20 Northing	Latitude (WGS84)	Longitude (WGS84)
CC-A1-1	292,951.39	4,818,244.60	43.4885	-65.5605
CC-A2-2	292,967.39	4,818,260.60	43.4886	-65.5604
CC-B-3	292,967.39	4,818,292.60	43.4889	-65.5604
CC-B-4	292,967.39	4,818,308.60	43.4890	-65.5604
CC-B-5	292,951.39	4,818,324.60	43.4892	-65.5606
CC-C-6	292,983.39	4,818,388.60	43.4898	-65.5602
CC-C-7	293,031.39	4,818,436.60	43.4902	-65.5596
CC-C-8	292,983.39	4,818,356.60	43.4895	-65.5602
CC-D1-9	293,015.39	4,818,340.60	43.4893	-65.5598
CC-D1-10	292,999.39	4,818,308.60	43.4891	-65.5600
CC-D2-11	292,999.39	4,818,292.60	43.4889	-65.5600
CC-D2-12	293,015.39	4,818,276.60	43.4888	-65.5598
CC-13	292,936.45	4,818,279.04	43.4888	-65.5607
CC-14	292,951.33	4,818,375.28	43.4896	-65.5606

The six samples from the areas previously sampled in 2011 were composited into two samples as indicated in Table 2.2.

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**Table 2.2 Sediment Sampling Composite Grouping**

Composite	Cripple Creek Sample Sites
A	3, 4, 5
B	6, 7, 8

## 2.3 SAMPLE ANALYSIS

At the time of sampling, six individual samples were combined to form two composite samples for analysis (see Table 2.2), while the other eight samples were submitted to the laboratory for individual analysis. All individual samples from composited locations were archived for potential additional analysis or confirmation of results, if required. The samples were analyzed by an SCC-accredited laboratory (Maxxam) for the following parameters:

- Carbon content, including total inorganic carbon (TIC) and total organic carbon (TOC)
- Grain size distribution
- Polycyclic aromatic hydrocarbons (PAH) - low level analysis and a scan for creosote were performed
- PAH Leachate (for selected samples)
- Heavy metals - this analysis included an ICP 23 metals scan plus mercury, hexavalent chromium, and hot water soluble boron
- Metals leachate (for selected samples)
- Total Cyanide (results included with heavy metals)
- Total petroleum hydrocarbons (TPH) and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) - this analysis included low level analysis for BTEX, silica gel cleanup for TPH, and the verification of a return to baseline at C32
- Polychlorinated biphenyls (PCB) and Dichlorodiphenyltrichloroethane (DDT) suite, and pentachlorophenol (PCP)

In order to facilitate the determination of dredge disposal options, the analytical results for heavy metals, PAH, TPH, BTEX, PCB, DDT, and PCP are compared to the following applicable guidelines:

- *Canadian Environmental Protection Act (CEPA) Disposal at Sea Screening Criteria;*
- CCME Soil Quality Guidelines (SQGs) for the Protection of Human and Environmental Health;
- Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills; and
- Nova Scotia Environmental Quality Standards (NS EQS) for Contaminated Sites, Tier 1 plus IACR.

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In addition, analytical results of leachate analyses were also compared to:

- CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life in Marine Environments; and
- Health Canada Guidelines for Canadian Drinking Water.

BTEX-TPH results were also compared to:

- Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 3.0
  - Risk-Based Screening Levels for Soils (RBSLs); and
  - Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life.

The following guidelines have been included in the tabulated analytical summaries, but are not discussed within the results section as per guidance by PWGSC:

- CCME Sediment Quality Guidelines (Interim Sediment Quality Guidelines (ISQGs)).
- CCME Sediment Quality Guidelines (Marine and Estuarine Probable Effects Levels (PELs)).

## 3.0 Analytical Results

The analytical results of the marine sediment samples collected from Cripple Creek are summarized in Tables A1 to A7 (Appendix A) and discussed below. For the PAH and metals results, only those parameters for which there are established regulatory guidelines or those used in the calculation of guideline concentrations are included in the tables. The complete set of analytical results, including laboratory QA/QC and Certificates of Analyses for all parameters tested, are provided in Appendix B.

### 3.1 GRAIN SIZE DISTRIBUTION

The sediment grain size composition for all samples is illustrated in Figure 3.1 and summarized in Table 3.1. Grain size distributions indicating median particle diameter are included in Appendix B. The majority of sediment samples are primarily sandy material with various amounts of silt, with the exception of CC-11 and CC-12, which are sandy silt.

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**Table 3.1 Sediment Grain Size Distribution at Cripple Creek DFO-SCH**

Sample	Grain Size Fraction			
	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
CC-1	6.4	11	82	<0.10
CC-2	16	34	50	<0.10
CC-9	7.2	23	70	<0.10
CC-10	6.5	25	69	0.17
CC-11	14	47	34	6.0
CC-12	17	50	34	<0.10
CC-13	1.6	1.5	97	<0.10
CC-14	2.7	21	76	<0.10
Composite A	13	36	51	0.10
Composite B	2.5	6.0	91	<0.10

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**Figure 3.1 Sediment Grain Size Distribution for Cripple Creek Samples**

## 3.2 CARBON CONTENT

Cripple Creek sediment contained total carbon ranging from 4.1 to 53 grams per kilogram (g/kg). Total organic carbon (TOC) was the predominant type for all samples except CC-13 and Composite B, and ranged from 1.5 to 43 g/kg. Total inorganic carbon was found in lower amounts, and ranged from 2.6 to 10 g/kg in the samples (Table A1).

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## 3.3 PAH CONCENTRATIONS – SEDIMENT

Total PAH levels in sediment should meet the regulated concentration of less than or equal to 2.5 milligrams per kilogram (mg/kg) under *CEPA* in order to comply with the *CEPA* Disposal at Sea sediment screening criteria. The CCME SQGs for the protection of human and environmental health stipulate guideline values for individual PAH compounds as well as the sum of individual PAH compounds for the calculation of the Index of Additive Cancer Risk (IACR). A summary of the results compared to each of the referenced guidelines is tabulated in Table A2 (Appendix A).

### 3.3.1 *CEPA* Disposal at Sea Guideline

Of the 10 sediment samples analyzed, five exceeded the *CEPA* Disposal at Sea Guideline for Total PAHs of 2.5 mg/kg. These include CC-1, CC-2, CC-11, CC-12 and Composite A, which have total concentrations of 3.03, 4.9, 6.34, 6.16 and 4.13/4.24 (duplicate) mg/kg, respectively.

### 3.3.2 CCME Soil Quality Guidelines – Human Health

The Index of Additive Cancer Risk (IACR), which identifies potential threats to potable groundwater quality from carcinogenic PAH leaching, was calculated for each sample and compared to the guideline value of 1. Seven of the 10 samples exceeded 1, and thus exceeded the CCME Soil Quality Guidelines for Human Health, including CC-1, CC-2, CC-9, CC-10, CC-11, CC-12 and Composite A.

### 3.3.3 CCME Soil Quality Guidelines – Environmental

Five sites exceeded the CCME Soil Quality Environmental Guidelines for one parameter (phenanthrene): these included CC-1, CC-2, CC-11, CC-12 and Composite A. The guideline exceeded is for freshwater life for agricultural, residential/parkland, and commercial/industrial land uses.

### 3.3.4 NS Guidelines for Disposal of Contaminated Solids in Landfills

All sediment samples taken met the Nova Scotia PAH guidelines for disposal of contaminated solids in landfills.

### 3.3.5 Nova Scotia Environmental Quality Standards

Sites CC-11 and CC-12 exceed the NS EQS for the sediment environment – freshwater. Analytical results for the all sites were below NS EQS guidelines for soils.

## 3.4 PAH CONCENTRATIONS – SPLP LEACHATE

Based on the total PAH results, five sediment samples underwent leachate analysis (Synthetic Precipitation Leaching Procedure [SPLP]; EPA Method 1312) as approved by PWGSC: these

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included CC-1, CC-2, CC-11, CC-12 and Composite A. Sediment leachate analytical results are presented in Table A3 (Appendix A) and compared to CCME Water Quality Guidelines (WQG) for the protection of freshwater and marine aquatic life, NS EQS guidelines for freshwater and marine, the Nova Scotia landfill disposal guidelines (leachate), and Health Canada Guidelines for Drinking Water Quality.

## **3.4.1 CCME Canadian Water Quality Guidelines for the Protection of Aquatic life**

All five samples that underwent leachate analysis exceeded the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life. Three parameters (anthracene, fluoranthene and pyrene) were exceeded by all five samples for freshwater environments.

## **3.4.2 Health Canada Guidelines for Canadian Drinking Water Quality**

None of the samples tested for leachates exceeded the Health Canada Guidelines for Canadian Drinking Water Quality.

## **3.4.3 Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills**

None of the samples that underwent leachate analysis exceeded the Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills.

## **3.4.4 Nova Scotia Environmental Quality Standards – Surface Water**

All five samples that underwent leachate analysis exceeded the NS EQS for surface water – freshwater. Three parameters exceeded this guideline, including anthracene, fluoranthene and pyrene.

All five samples also exceeded the NS EQS for surface water – marine. Each had only one parameter that exceeded the guideline, which was pyrene.

## **3.4.5 Nova Scotia Environmental Quality Standards – Groundwater**

None of the samples that underwent leachate analysis exceeded the NS EQS for groundwater.

## **3.5 METAL CONCENTRATIONS - SEDIMENT**

Metal concentrations in the sediment samples were compared to CEPA Disposal at Sea criteria, CCME Soil Quality Guidelines (SQGs), Nova Scotia landfill disposal guidelines, and NS EQS Guidelines. Any observed exceedances of these guidelines are summarized below. Results for cyanide are included and discussed with the metal results. A summary of the results compared to each of the referenced guidelines is tabulated in Table A4 (Appendix A).

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## 3.5.1 CEPA Disposal at Sea Screening Criteria – Lower Level

One sample exceeded the CEPA Disposal at Sea Screening Criteria, which was CC-12. This sample exceeded for only one parameter, cadmium.

## 3.5.2 CCME Soil Quality Guidelines – Environmental and Human Health

Four sediment samples exceeded the guidelines for CCME Soil Quality Guidelines for Environmental and Human Health. Exceedances occurred for Boron (total) for CC-2, CC-11, CC-12 and Composite A. All four of these exceeded the guideline for agricultural land use.

Results for cyanide may also exceed the CCME Soil Quality Guidelines. The laboratory Reportable Detection Limit (RDL) for CC-2, CC-11, CC-12 and Composite A was 1.0 mg/kg, and cyanide was non-detect. However, this RDL is above the cyanide guideline for agricultural land use and residential/parkland land use (0.9 mg/kg). As such, it is not possible to determine if an exceedance occurred in those samples based on this data.

## 3.5.3 Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills

All ten samples exceeded, or potentially exceeded, the Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills. Samples CC-2, CC-11, CC-12 and Composite A exceed the guidelines for boron. For the remaining samples, boron was not detected in the lab analysis; however, the RDL (50 mg/kg) is much higher than the guideline for boron (2 mg/kg). As such, it is not possible to determine if boron exceeds the guidelines in those samples based on this data.

Analytical results show that cyanide does not exceed these guidelines for any samples.

## 3.5.4 Nova Scotia Environmental Quality Standards

All ten samples exceeded the Nova Scotia Environmental Quality Standards. All samples exceeded the guidelines for boron (hot water soluble) for potable and non-potable sites with coarse and fine-grained soils for agricultural land use. Two samples, CC-11 and CC-12, also exceed guidelines for boron for potable and non-potable sites with coarse and fine-grained soils for residential/parkland and commercial land uses. Two samples, CC-11 and CC-12, also exceed the guideline for iron for potable and non-potable sites with coarse and fine-grained soils for agricultural, residential/parkland and commercial use. However, iron at the concentrations measured would be considered to be background in most areas of Nova Scotia.

Four samples, CC-2, CC-11, CC-12 and Composite A, may exceed the guideline for cyanide. The RDL for cyanide is 1 mg/kg, whereas the guideline for potable and non-potable sites with coarse and fine-grained soils for agricultural use is 0.9. As such, it is not possible to determine if cyanide exceeds the guideline in those samples, based on this data.

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## 3.6 METALS – LEACHATE

Based on the results of the metals analysis, three samples were sent for metals leachate analysis: CC-2, CC-11, and CC-12. These results are presented in Table A5 (Appendix A) and are compared to the NS Guidelines for Disposal of Contaminated Solids in Landfills, the CCME Canadian WQG for the Protection of Aquatic Life, The CCME Canadian WQG for the Protection of Agriculture, the Health Canada Canadian Guidelines for Drinking Water Quality and the NS EQS. These results are summarized below.

### 3.6.1 Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills

None of the samples submitted for leachate analysis exceeded the Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills.

### 3.6.2 CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life

The three samples submitted for leachate analysis all exceeded the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life. Both copper and lead had exceedances for freshwater.

The three samples may also exceed the guideline for silver. The RDL for silver is 0.50 µg/L, whereas the guideline for freshwater aquatic life is 0.10 µg/L. As such, it is not possible to determine if silver exceeds the guideline in those samples, based on this data.

### 3.6.3 CCME Canadian Water Quality for the Protection of Agriculture

None of the samples submitted for leachate analysis exceeded the CCME Canadian Water Quality for the Protection of Agriculture.

### 3.6.4 Health Canada Guidelines for Canadian Drinking Water

All three samples, CC-2, CC-11 and CC-12, exceeded the Health Canada Guidelines for Canadian Drinking Water. Each exceeded the guideline for aluminum, which is an operational guideline based on conventional water treatment systems.

### 3.6.5 Nova Scotia Environmental Quality Standards

The three samples submitted for leachate analysis all exceeded the Nova Scotia Environmental Quality Standards. All exceed standards for surface water, for both freshwater and marine. Under the guideline for fresh water, all three samples have exceedances for aluminum, copper and lead. All three samples may also have exceedances for cadmium and silver, but RDLs are below the guidelines for these samples. Sample CC-12 also exceeds the freshwater guideline for vanadium. For the marine guidelines, all samples exceed guidelines for copper and may again exceed the guideline for cadmium. In addition, CC-12 exceeds the marine guideline for zinc. For groundwater, there is only one exceedance. CC-12 exceeds the ground water guidelines

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for potable sites with fine and coarse-grained soils for agricultural/residential and commercial/industrial land uses for one parameter, vanadium.

## 3.7 BTEX-TPH

BTEX (benzene, toluene, ethylbenzene and xylene) and TPH (total petroleum and hydrocarbon) analytical results were compared to the Atlantic Risk Based Corrective Action (RBCA) Tier I guidelines, the CCME Soil Quality Guidelines, the NS Guidelines for Disposal of Contaminated Solids in Landfills, and the NS EQS. A summary of the results compared to each of the referenced guidelines is tabulated in Table A6 (Appendix A). These results are summarized below.

### 3.7.1 Atlantic RBCA Tier 1

None of the sediment samples taken at Cripple Creek Harbour exceeded the Atlantic RBCA Tier I guidelines.

### 3.7.2 Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life

Seven samples exceeded the Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life; CC-1, CC-2, CC-9, CC-10, CC-11, CC-12 and Composite A. The dominant hydrocarbon resemblance for Cripple Creek is fuel oil, which determines which guideline is to be used. Exceedances were all for the 'typical' sediment type.

### 3.7.3 CCME Soil Quality Guidelines

No samples exceeded the CCME Soil Quality Guidelines for either surface or subsoil.

### 3.7.4 Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills

No samples exceeded the Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills.

### 3.7.5 Nova Scotia Environmental Quality Standards

For soils, two samples exceed the NS EQS; CC-12 and Composite A. The standards for agricultural land use are exceeded for both potable and non-potable sites with coarse-grained and fine-grained soils.

## 3.8 PCBS, DDT AND PCP

Analytical results for Polychlorinated Biphenyl (PCB), Dichloro-Diphenyl-Trichloroethane (DDT) and Pentachlorophenol (PCP) were compared to the CEPA Disposal at Sea Screening Criteria, the NS Guidelines for Disposal of Contaminated Solids in Landfills and the Nova Scotia Environmental Quality Standards for potable and non-potable sites. A summary of the results compared to each of the referenced guidelines is tabulated in Table A7 (Appendix A).

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The CEPA disposal at sea guideline for Total PCB was below the RDL for samples CC-1, CC-2, CC-10, CC-11, CC-12, and Composite A. As such, these samples may exceed those guidelines, based on this data.

## 3.9 QUALITY ASSURANCE/QUALITY CONTROL

All samples collected were labeled on site using a waterproof marker with the date, sample site identifier, and sample number. Once retrieved, samples were placed upright on ice inside a cooler for safe storage and transport, and were hand-delivered to the laboratory immediately (<24 h) following the completion of the field program. A copy of the Chain of Custody (COC) that accompanied the sediment samples is provided in Appendix B. Additional samples from each station were collected to safeguard against loss or damage during transport, and will be stored and refrigerated until the final report is received and approved by PWGSC.

Sample collection, preparation, and analyses followed guidance provided in the Environment Canada document referenced in Section 2.2. Samples were analyzed for each physicochemical parameter in the program by an accredited laboratory (Maxxam Analytics, Bedford, NS) certified by the Standards Council of Canada (SCC). The complete set of analytical results is provided in Appendix B, including laboratory QA/QC and Certificates of Analyses for all parameters tested. The laboratory undertakes internal duplicate analyses for QA/QC purposes. Laboratory duplicate analyses were performed for various parameters to meet internal QA/QC objectives for the samples submitted for Cripple Creek. No discrepancies were noted by the laboratory for the duplicate analyses.

To assess the quality of the analytical data, a review of the internal laboratory QA/QC results was completed including a review of laboratory duplicate analyses, method blanks, surrogates, spike samples, and QA/QC standards. The following information applicable to this MSSP report findings was noted:

- A number of the PAH leachate samples had elevated RDLs because of limited sample size. The detection limits for OC pesticide (PCB and DDT) analysis were adjusted for high moisture content. Due to the sample matrix, some samples required dilution. Detection limits were adjusted accordingly. Due to the sample matrix for CHP analysis (pentachlorophenol), most of the samples required dilution. Detection limits were adjusted accordingly. Also, detection limits were adjusted for high moisture content.

None of the items noted above is expected to produce unacceptable analytical results, and therefore the data quality is considered to be acceptable.

# FINAL REPORT - MARINE SEDIMENT SAMPLING PROGRAM: CRIPPLE CREEK DFO-SCH, SHELburne COUNTY, NOVA SCOTIA

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## 4.0 CONCLUSION

The analytical results of the ten sediment samples collected from Cripple Creek indicate a variety of guideline exceedances. All guidelines with which results were compared had exceedances for at least one sample and one parameter. CEPA Disposal Guidelines and NS Guidelines for Disposal for Contaminated Soils in Landfills were both exceeded by PAH and metals. Subsequent PAH and Metals leachate analysis results in exceedances of several guidelines, including NS EQS for surface water and the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life. These results are an important factor in the determination of a disposal site for the dredged material from Cripple Creek Harbour.

**FINAL REPORT - MARINE SEDIMENT SAMPLING PROGRAM: CRIPPLE CREEK DFO-SCH,  
SHELBURNE COUNTY, NOVA SCOTIA**

September 4, 2015

**5.0 CLOSING**

This document has been prepared and reviewed by the following Stantec personnel:

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**FINAL REPORT - MARINE SEDIMENT SAMPLING PROGRAM: CRIPPLE CREEK DFO-SCH,  
SHELburnE COUNTY, NOVA SCOTIA**

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**Appendix A : Tabulated Results**

**Table A1 TIC,TOC, and Grain Size Results for Marine Sediments - Cripple Creek, Shelburne County, Nova Scotia**

Parameter	RDL	Units	Sample Identification and Date											
			CC-1	CC-2	CC-2 Lab-Dup	CC-9	CC-10	CC-11	CC-12	CC-13	CC-14	COMPOSITE A	COMPOSITE A Lab Dup	COMPOSITE B
<b>Grain Size Results</b>														
< PHI -1 (2 mm)	0.10	%	100	100	n/a	100	100	94	100	100	100	100	99	100
< PHI 0 (1mm)	0.10	%	99	94	n/a	99	99	90	95	100	100	95	94	99
< PHI +1 (0.5 mm)	0.10	%	98	89	n/a	98	96	87	91	99	99	90	90	89
< PHI +2 (0.25 mm)	0.10	%	78	83	n/a	89	82	82	87	80	95	84	86	60
< PHI +3 (0.12 mm)	0.10	%	22	61	n/a	44	44	73	78	11	47	61	64	16
< PHI +4 (0.062 mm)	0.10	%	18	50	n/a	30	31	60	66	3.1	24	49	52	8.6
< PHI +5 (0.031 mm)	0.10	%	15	40	n/a	19	23	44	57	2.0	7.5	37	38	5.2
< PHI +6 (0.016 mm)	0.10	%	8.7	24	n/a	12	10	24	34	1.6	3.3	20	22	3.4
< PHI +7 (0.0078 mm)	0.10	%	6.4	18	n/a	8.0	7.4	16	20	1.6	2.7	14	15	2.6
< PHI +8 (0.0039 mm)	0.10	%	6.4	16	n/a	7.2	6.5	14	17	1.6	2.7	13	13	2.5
< PHI +9 (0.0020 mm)	0.10	%	5.8	14	n/a	6.4	5.9	11	14	1.9	2.7	11	11	2.6
Gravel	0.10	%	<0.10	<0.10	n/a	<0.10	0.17	6.0	<0.10	<0.10	<0.10	0.10	0.61	<0.10
Sand	0.10	%	82	50	n/a	70	69	34	34	97	76	51	48	91
Silt	0.10	%	11	34	n/a	23	25	47	50	1.5	21	36	38	6.0
Clay	0.10	%	6.4	16	n/a	7.2	6.5	14	17	1.6	2.7	13	13	2.5
<b>Other</b>														
Total Organic Carbon (TOC)	Variable 0.8 to 1.1	g/kg	12	42	43	12	13	40	39	1.5	2.5	29	n/a	3.3
Total Inorganic Carbon (TIC)	Variable 0.8 to 1.1	g/kg	4.6	10	n/a	3.9	2.6	4.0	4.2	6.2	1.6	18	n/a	10
Total Carbon (TC)	Variable 0.7 to 1.0	g/kg	17	53	n/a	16	15	44	43	7.7	4.1	47	n/a	13
Moisture	-	%	45	60	n/a	37	35	59	63	19	33	63	n/a	20

NOTE(S):

Table A2 PAH Results for Marine Sediments - Cripple Creek, Shelburne County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date										CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines				CCME Soil Quality Guidelines										Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (2005)				
			CC-1	CC-2	CC-9	CC-10	CC-11	CC-12	CC-13	CC-14	COMPOSITE A	COMPOSITE A Lab Dup		COMPOSITE B	Interim Sediment Quality Guidelines		Probable Effects Levels		Human Health		Environmental Health			Interim Soil Quality Criteria								
			25-Jun-15											Freshwater	Marine	Freshwater	Marine	Potable Water	Direct Contact	Soil Contact		Soil and Food Ingestion	Freshwater Life	Agricultural Land Use	Residential/Parkland Land Use	Commercial and Industrial Land Uses						
														Agricultural, Residential/Parkland, Commercial and Industrial Land Uses	Agricultural, Residential/Parkland, Commercial and Industrial Land Uses	Agricultural and Residential/Parkland Land Uses	Commercial and Industrial Land Uses	Agricultural and Residential/Parkland Land Uses	Residential/Parkland, Commercial/Industrial Land Uses	Agricultural, Residential/Parkland, Commercial/Industrial Land Uses	Agricultural Land Use	Residential/Parkland Land Use	Commercial and Industrial Land Uses									
<b>Polycyclic Aromatic Hydrocarbon (PAH) Results</b>																																
1-Methylnaphthalene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10	
2-Methylnaphthalene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10	
Acenaphthene	0.0050		<0.0050	0.015	<0.0050	<0.0050	0.020	<0.0050	<0.0050	<0.0050	<0.0050	0.030	0.027	<0.0050	<0.0050	0.00671	0.00671	0.0889	0.0889	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10	
Acenaphthylene	0.0050		0.0096	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.00587	0.00587	0.128	0.128	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10	
Anthracene	0.0050		0.069	0.090	0.016	0.040	0.13	0.13	<0.0050	<0.0050	<0.0050	0.12	0.13	<0.0050	<0.0050	0.0469	0.0469	0.245	0.245	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10	
Benzo(a)anthracene	0.0050		0.2	0.32	0.053	0.170	0.45	0.420	<0.0050	0.022	0.25	0.29	<0.0050	<0.0050	<0.0050	0.0371	0.0748	0.385	0.693	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10	
Benzo(a)pyrene	0.0050		0.18	0.29	0.062	0.200	0.53	0.50	<0.0050	0.017	0.23	0.270	<0.0050	<0.0050	<0.0050	0.0319	0.0888	0.782	0.763	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Benzo(b)fluoranthene	0.0050		0.29	0.41	0.066	0.200	0.53	0.51	<0.0050	0.024	0.33	0.30	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Benzo(b+j)fluoranthene	0.0050		0.43	0.61	0.106	0.310	0.82	0.79	<0.0050	0.037	0.5	0.47	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Benzo(g,h,i)perylene	0.0050		0.1	0.14	0.035	0.082	0.24	0.24	<0.0050	0.0085	0.12	0.13	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Benzo(j)fluoranthene	0.0050	mg/kg	0.14	0.20	0.040	0.110	0.29	0.28	<0.0050	0.013	0.17	0.17	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Benzo(k)fluoranthene	0.0050		0.14	0.19	0.039	0.110	0.29	0.28	<0.0050	0.012	0.18	0.17	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Chrysene	0.0050		0.42	0.83	0.092	0.200	0.58	0.58	<0.0050	0.028	0.40	0.47	<0.0050	<0.0050	<0.0050	0.0571	0.108	0.862	0.846	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Dibenz(a,h)anthracene	0.0050		0.031	0.043	0.0098	0.024	0.074	0.073	<0.0050	<0.0050	0.035	0.039	<0.0050	<0.0050	<0.0050	0.00622	0.00622	0.135	0.135	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Fluoranthene	0.0050		0.46	0.81	0.11	0.410	1.1	1.1	<0.0050	0.044	0.80	0.790	0.010	<0.0050	<0.0050	0.111	0.113	2.355	1.494	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Fluorene	0.0050		0.022	0.036	0.0084	0.008	0.037	0.027	<0.0050	<0.0050	0.045	0.050	<0.0050	<0.0050	<0.0050	0.0212	0.0212	0.144	0.144	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Indeno(1,2,3-c,d)pyrene	0.0050		0.099	0.13	0.029	0.072	0.21	0.20	<0.0050	0.0078	0.11	0.11	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Naphthalene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0346	0.0346	0.391	0.391	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Perylene	0.0050		0.072	0.130	0.030	0.058	0.16	0.16	<0.0050	<0.0050	0.15	0.15	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Phenanthrene	0.0050		0.075	0.16	0.021	0.033	0.070	0.06	<0.0050	0.011	0.14	0.17	<0.0050	<0.0050	<0.0050	0.0419	0.0867	0.515	0.544	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Pyrene	0.0050		0.29	0.5	0.077	0.300	0.81	0.81	<0.0050	0.029	0.50	0.50	0.0070	<0.0050	<0.0050	0.053	0.153	0.875	1.398	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	10
Total PAH			3.03	4.90	0.79	2.33	6.34	6.16	<0.0050	0.25	4.13	4.24	0.02	2.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	50	
Index of Additive Cancer Risk (IACR)			8.3	11.8	2.2	6.5	17.2	16.2	0.2	0.8	10.2	9.87	0.3	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(a)pyrene TPE (10 <sup>-5</sup> )		mg/kg	0.30	0.47	0.10	0.29	0.79	0.68	0.01	0.06	0.37	0.39	0.03	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Creosote or Coal Tar source suspected/known?		yes/no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Benzo(a)pyrene TPE (10 <sup>-5</sup> ) with Uncertainty Factor		mg/kg	0.30	0.47	0.10	0.29	0.79	0.68	0.01	0.06	0.37	0.39	0.03	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

NOTE(S):

Total PAH calculation based on the sum of 21 individual PAH compounds as per guidance from Environment Canada, 2009.

Additive Cancer Risk (IACR) = ((Benzo(a)anthracene)/0.33mg/kg) + ((Benzo(a)pyrene)/0.37mg/kg) + ((Benzo(b+j)fluoranthene)/0.16mg/kg) + ((Benzo(g,h,i)perylene)/6.8mg/kg) + ((Benzo(k)fluoranthene)/0.034mg/kg) + ((Chrysene)/2.1mg/kg) + ((Dibenz(a,h)anthracene)/0.23mg/kg) + ((Indeno(1,2,3-c,d)pyrene)/2.7mg/kg).

Total Potency Equivalent (TPE) based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10<sup>-5</sup>).

Benzo(a)pyrene TPE (10<sup>-5</sup>) = Sum of PAH concentration multiplied by their respective Benzo(a)pyrene Potency Equivalency Factors: ((Benzo(a)anthracene)\*0.1) + ((Benzo(a)pyrene)\*1) + ((Benzo(b+j)fluoranthene)\*0.1) + ((Benzo(k)fluoranthene)\*0.1) + ((Benzo(g,h,i)perylene)\*0.01) + ((Chrysene)\*0.01) + ((Dibenz(a,h)anthracene)\*1) + ((Indeno(1,2,3-c,d)pyrene)\*0.1).

\*values are multiplication factors used to calculate the IACR

**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**

**Dotted Outline** = CEPA Disposal at Sea Screening Criteria

**Highlighted Orange** = CCME Sediment Quality Guidelines: Interim Sediment Quality Guidelines

**Underline** = CCME Sediment Quality Guidelines: Probable Effects Levels

**Italics** = CCME Soil Quality Guidelines: Human Health (including IACR index)

**Red numbering** = CCME Soil Quality Guidelines: Environmental Health

**Greyed Cells** = Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills



Table A3 PAH Results for Leachate Samples - Cripple Creek, Shelburne County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date					CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life	Health Canada Guidelines for Canadian Drinking Water Quality	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (2005)	Nova Scotia Environmental Quality Standards									
			CC-1	CC-2	CC-11	CC-12	COMPOSITE A				COMPOSITE A Lab-Dup	Surface Water		Groundwater						
												Freshwater	Marine	Potable	Non-Potable					
														Coarse- and Fine-Grained Soils	Fine-Grained Soils		Coarse-Grained Soils			
		Agricultural/ Residential and Commercial /	Agricultural/ Residential Land Use	Commercial/ Industrial Land Use	Agricultural/ Residential Land Use	Commercial/ Industrial Land Use														
<b>Leachable Polycyclic Aromatic Hydrocarbons (PAHs)</b>																				
1-Methylnaphthalene	0.010	µg/L	<0.010	0.011	<0.020	<0.020	0.032	0.025	-	-	-	-	2	1	12	35000	150000	6200	38000	
2-Methylnaphthalene	0.010		0.011	0.018	<0.020	<0.020	0.045	0.036	-	-	-	-	2	2	12	35000	150000	6200	38000	
Acenaphthene	0.0050		0.051	0.096	0.11	0.010	0.12	0.094	5.8	-	-	-	5.8	6	1400	-	-	-	-	
Acenaphthylene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	<0.0070	-	-	-	4.6	6	4.5	120	1700	36	750	
Anthracene	0.0050		<b>0.030</b>	<b>0.030</b>	<b>0.052</b>	<b>0.031</b>	<b>0.021</b>	<b>0.017</b>	0.012	-	-	-	0.012	-	-	-	-	-	-	
Benz(a)anthracene	0.0050		0.0080	0.0056	0.012	0.012	<0.0060	<0.0070	0.018	-	-	-	0.018	-	-	-	-	-	-	
Benzo(a)pyrene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	0.015	-	0.01	-	0.015	0.01	0.01	-	-	-	-	
Benzo(b)fluoranthene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	-	-	-	-	0.48	-	-	-	-	-	-	
Benzo(g,h,i)perylene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	-	-	-	-	0.17	-	-	-	-	-	-	
Benzo(j)fluoranthene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	-	-	-	-	0.48	-	-	-	-	-	-	
Benzo(k)fluoranthene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	-	-	-	-	0.48	-	-	-	-	-	-	
Chrysene	0.0050		0.0098	0.0065	0.0090	0.0082	<0.0060	<0.0070	-	-	-	-	1.4	0.1	-	-	-	-	-	
Dibenz(a,h)anthracene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	-	-	-	-	0.26	-	-	-	-	-	-	
Fluoranthene	0.010		<b>0.20</b>	<b>0.14</b>	<b>0.28</b>	<b>0.21</b>	<b>0.085</b>	<b>0.084</b>	0.04	-	-	-	0.04	11	-	-	-	-	-	
Fluorene	0.0070		0.074	0.11	0.098	0.039	0.086	0.074	3	-	-	-	3	12	940	-	-	-	-	
Indeno(1,2,3-cd)pyrene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	-	-	-	-	0.21	-	-	-	-	-	-	
Naphthalene	0.020		<0.020	0.021	<0.030	<0.030	0.051	<0.030	1.1	1.4	-	-	1.1	1.4	470	14000	-	-	600	7000
Perylene	0.0050		<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0070	-	-	-	-	-	-	-	-	-	-	-	
Phenanthrene	0.020		0.085	0.17	0.032	0.041	0.069	0.066	0.4	-	-	-	0.4	4.6	-	-	-	-	-	
Pyrene	0.0060		<b>0.088</b>	<b>0.063</b>	<b>0.15</b>	<b>0.11</b>	<b>0.039</b>	<b>0.057</b>	0.025	-	-	-	0.025	0.02	710	-	-	-	-	
Total PAH	-	0.557	0.671	0.743	0.461	0.548	0.453	-	-	-	10	-	-	-	-	-	-	-		

NOTE(S):

Total PAH is the sum of all PAHs, including 1/2 RDL for those that are non-detect

**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**

**Highlighted** = indicates value exceeds CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life in Freshwater

*Italics* = indicates value exceeds CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life in Marine Environments

**Red numbering** = Health Canada Guidelines for Canadian Drinking Water

Greyed Cells = Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills

**Bold** = Indicates value exceeds NSEQS Surface Water (Freshwater) guidelines

Underline = Indicates value exceeds NSEQS Surface Water (Marine) guidelines

**Dotted outline** = Indicates value exceeds one or more of the NSEQS Groundwater guidelines

Table A4 Metal Results for Marine Sediments - Cripple Creek, Shelburne County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date										CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines				CCME Soil Quality Guidelines for the Protection of Environmental and Human Health				Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (2005)		
			CC-1	CC-2	CC-9	CC-10	CC-11	CC-12	CC-13	CC-14	COMPOSITE A	COMPOSITE B		Interim Sediment Quality Guidelines		Probable Effects Levels		Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use			
			25-Jun-15											Freshwater	Marine	Freshwater	Marine							
Aluminum	10	mg/kg	3400	6500	3900	4200	8200	8700	1800	3100	5900	2400	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-	-	-	20	20	40	40	40	40
Arsenic	2.0		<2.0	4.8	2.4	2.9	4.6	5.2	<2.0	<2.0	3.2	<2.0	<2.0	-	5.9	7.24	17.0	41.6	12	12	12	12	50	50
Barium	5.0		14	27	18	18	33	34	7.2	16	25	11	11	-	-	-	-	-	750	500	2000	2000	2000	2000
Beryllium	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-	-	-	4	4	8	8	8	8
Bismuth	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-	-	-	-	-	-	-	-	-
Boron (Total)	50		<50*	77	<50*	<50*	66	66	<50*	<50*	55	<50*	<50*	-	-	-	-	-	2	-	-	-	-	2
Boron (Hot Water Soluble)	3.0		12	29	9.1	11	28	26	2.6	6.1	23	5.2	5.2	-	-	-	-	-	-	-	-	-	-	-
Cadmium	0.30		<0.30	0.53	<0.30	<0.30	0.59	0.64	<0.30	<0.30	0.50	<0.30	<0.30	0.6	0.6	0.7	3.5	4.2	1.4	10	22	22	22	20
Chromium (Hexavalent)	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-	0.4	0.4	1.4	1.4	8	8
Chromium (Total)	2.0		8.3	16	8.8	9.8	20	21	3.9	6.7	14	5.6	5.6	-	37.3	52.3	90.0	160	64	64	87	87	800	
Cobalt	1.0		1.8	3.5	2.1	2.3	4.4	4.7	<1.0	1.7	3.3	1.3	1.3	-	-	-	-	-	40	50	300	300	300	
Copper	2.0		4.4	11	4.8	5.9	17	18	<2.0	<2.0	8.7	<2.0	<2.0	-	35.7	18.7	197	108	63	63	91	91	500	
Cyanide (Total)	1		<0.5	<1*	<0.5	<0.5	<1*	<1*	<0.5	<0.5	<1*	<0.5	<0.5	-	-	-	-	-	0.9	0.9	8	8	500	
Iron	50		5500	11000	6000	6900	13000	14000	2800	4700	9700	3900	3900	-	-	-	-	-	-	-	-	-	-	-
Lead	0.50		5.7	11	5.5	6.8	18	19	0.98	2.2	8.5	1.4	1.4	-	35.0	30.2	91.3	112	70	140	260	600	1000	
Lithium	2.0		9.1	16	10	12	22	23	4.9	8.3	15	6.9	6.9	-	-	-	-	-	-	-	-	-	-	-
Manganese	2.0		72	130	86	93	160	170	46	78	120	55	55	-	-	-	-	-	-	-	-	-	-	-
Mercury (Total)	0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.75	0.17	0.13	0.486	0.7	6.6	6.6	24	50	10	10
Molybdenum	2.0		<2.0	2.4	<2.0	<2.0	3.6	4.3	<2.0	<2.0	3.0	<2.0	<2.0	-	-	-	-	-	5	10	40	40	40	
Nickel	2.0		5.5	11	5.7	6.5	14	14	2.4	3.9	10	3.4	3.4	-	-	-	-	-	50	50	50	50	500	
Rubidium	2.0		6.6	13	7.9	8.5	16	17	3.4	6.6	12	5.1	5.1	-	-	-	-	-	-	-	-	-	-	
Selenium	1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	-	-	-	1	1	2.9	2.9	10	
Silver	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	-	-	-	-	20	20	40	40	40		
Strontium	5.0	31	120	18	24	55	49	27	10	100	47	47	-	-	-	-	-	-	-	-	-	-		
Thallium	0.10	0.11	0.20	0.12	0.12	0.23	0.23	<0.10	<0.10	0.40	<0.10	<0.10	-	-	-	-	-	1	1	1	1	1		
Tin	1.0	<1.0	<1.0	<1.0	<1.0	2.7	2.2	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	-	-	-	5	50	300	300	300		
Uranium	0.10	0.53	1.0	0.57	0.71	1.5	1.8	0.22	0.61	1.1	0.29	0.29	-	-	-	-	-	23	23	33	300	-		
Vanadium	2.0	8.4	18	9.7	11	21	23	4.1	7.1	16	5.5	5.5	-	-	-	-	-	130	130	130	130	200		
Zinc	5.0	24	45	29	23	50	53	7.1	13	34	10	10	-	123	124	315	271	200	200	360	360	1500		

NOTE(S):

\* detection limit is higher than one or more guideline.

**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**

Dotted Outline = CEPA Disposal at Sea Screening Criteria

Highlighted Orange = CCME Sediment Quality Guidelines: Interim Sediment Quality Guidelines

Underline = CCME Sediment Quality Guidelines: Probable Effects Levels

**Table A4 Metal Results for Marine Sediments - Cripple Creek, Shelburne County, Nova Scotia**

Parameter	RDL	Units	Sample Identification and Date										CEPA Disposal at Sea Screening Criteria - Lower Level	Nova Scotia Environmental Quality Standards						
			CC-1	CC-2	CC-9	CC-10	CC-11	CC-12	CC-13	CC-14	COMPOSITE A	COMPOSITE B		Potable and Non-Potable Sites with Coarse- and Fine-Grained Soils				Sediment Environment		
			25-Jun-15											Agricultural Land Use	Residential/Parkland Land Use	Commerical Land Use	Industrial Land Use	Freshwater	Marine	
Aluminum	10	mg/kg	3400	6500	3900	4200	8200	8700	1800	3100	5900	2400	-	15400	15400	15400	198000	-	-	
Antimony	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	7.5	7.5	63	63	25	-
Arsenic	2.0		<2.0	4.8	2.4	2.9	4.6	5.2	<2.0	<2.0	3.2	<2.0	<2.0	-	17	31	31	31	17	41.6
Barium	5.0		14	27	18	18	33	34	7.2	16	25	11	-	400	10000	15000	140000	-	-	
Beryllium	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	5	38	320	320	-	-
Bismuth	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-	-	-	-	-
Boron (Total)	50		<50*	<b>77</b>	<50*	<50*	<b>66</b>	<b>66</b>	<50*	<50*	<b>55</b>	<50*	<50*	-	4300	4300	24000	24000	-	-
Boron (Hot Water Soluble)	3.0		12	29	9.1	11	28	26	2.6	6.1	23	5.2	-	2	-	-	-	-	-	-
Cadmium	0.30		<0.30	0.53	<0.30	<0.30	0.59	<b>0.64</b>	<0.30	<0.30	0.50	<0.30	<0.30	0.6	1.4	14	49	192	3.5	4.2
Chromium (Hexavalent)	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	0.4	160	1300	1300	-	-
Chromium (Total)	2.0		8.3	16	8.8	9.8	20	21	3.9	6.7	14	5.6	-	52	220	630	2300	90	160	
Cobalt	1.0		1.8	3.5	2.1	2.3	4.4	4.7	<1.0	1.7	3.3	1.3	-	20	22	250	250	-	-	
Copper	2.0		4.4	11	4.8	5.9	17	18	<2.0	<2.0	8.7	<2.0	-	63	1100	4000	16000	197	108	
Cyanide (Total)	1		<0.5	<b>&lt;1*</b>	<0.5	<0.5	<b>&lt;1*</b>	<b>&lt;1*</b>	<0.5	<0.5	<b>&lt;1*</b>	<0.5	-	0.9	29	110	420	420	-	-
Iron	50		5500	11000	6000	6900	<b>13000</b>	<b>14000</b>	2800	4700	9700	3900	-	11000	11000	11000	144000	43766	-	
Lead	0.50		5.7	11	5.5	6.8	18	19	0.98	2.2	8.5	1.4	-	70	140	260	740	91.3	112	
Lithium	2.0		9.1	16	10	12	22	23	4.9	8.3	15	6.9	-	-	-	-	-	-	-	-
Manganese	2.0		72	130	86	93	160	170	46	78	120	55	-	-	-	-	-	-	1100	-
Mercury (Total)	0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.75	6.6	6.6	24	99	0.486	0.7
Molybdenum	2.0		<2.0	2.4	<2.0	<2.0	3.6	4.3	<2.0	<2.0	3.0	<2.0	<2.0	-	40	110	1200	1200	-	-
Nickel	2.0		5.5	11	5.7	6.5	14	14	2.4	3.9	10	3.4	-	50	330	2200	2200	75	-	
Rubidium	2.0		6.6	13	7.9	8.5	16	17	3.4	6.6	12	5.1	-	-	-	-	-	-	-	
Selenium	1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1	80	125	1135	2	-	
Silver	0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	20	77	490	490	1	2.2	
Strontium	5.0		31	120	18	24	55	49	27	10	100	47	-	9400	9400	9400	122000	-	-	
Thallium	0.10		0.11	0.20	0.12	0.12	0.23	0.23	<0.10	<0.10	0.40	<0.10	-	1	1	1	1	1	-	-
Tin	1.0		<1.0	<1.0	<1.0	<1.0	2.7	2.2	<1.0	<1.0	<1.0	<1.0	-	5	9400	9400	122000	-	-	
Uranium	0.10		0.53	1.0	0.57	0.71	1.5	1.8	0.22	0.61	1.1	0.29	-	23	23	33	300	-	-	
Vanadium	2.0	8.4	18	9.7	11	21	23	4.1	7.1	16	5.5	-	39	39	160	160	-	-		
Zinc	5.0	24	45	29	23	50	53	7.1	13	34	10	-	200	5600	47000	47000	315	271		

NOTE(S):

\* detection limit is higher than one or more guideline.

**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**

Dotted Outline = CEPA Disposal at Sea Screening Criteria

**Highlighted Orange** = CCME Sediment Quality Guidelines; Interim Sediment Quality Guidelines

Underline = CCME Sediment Quality Guidelines: Probable Effects Levels

**Table A5 Metals Results for Leachate Samples - Cripple Creek, Shelburne County, Nova Scotia**

Parameter	RDL	Units	Sample Identification and Date			NS Guidelines for Disposal of Contaminated Solids in Landfills	CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life		CCME Canadian Water Quality Guidelines for the Protection of Agriculture		Health Canada Canadian Guidelines for Drinking Water Quality		Nova Scotia Environmental Quality Standards		
			CC-2	CC-11	CC-12		Freshwater	Marine	Irrigation	Livestock	Maximum Acceptable Concentration	Aesthetic Objective	Surface Water		Groundwater
			23-Jun-15										Freshwater	Marine	
														Potable with Fine- and Coarse-Grained Soils	
Aluminum	10	µg/L	<b>230</b>	<b>220</b>	<b>260</b>	500,000	-	-	5000	5000	-	100**	5	-	-
Antimony	2.0		<2.0	<2.0	<2.0	-	-	-	-	-	6	-	20	500	6
Arsenic	2.0		4.7	3.4	4.3	5,000	5	12.5	100	25	10	-	5.0	12.5	10
Barium	5.0		39	33	120	100,000	-	-	-	-	1000	-	1000	500	1000
Beryllium	2.0		<2.0	<2.0	<2.0	10,000	-	-	100	100	-	-	5.3	100	4
Cadmium	0.30		<b>&lt;0.30*</b>	<b>&lt;0.30*</b>	<b>&lt;0.30*</b>	500	0.09	0.12	5.1	80	5	-	0.01	0.12	5
Calcium	100		24000	19000	20000	-	-	-	-	-	-	-	-	-	-
Chromium	2.0		<2.0	<2.0	<2.0	5,000	-	-	-	-	50	-	-	-	50
Cobalt	1.0		<1.0	<1.0	<1.0	5,000	-	-	50	1000	-	-	10	-	10
Copper	2.0		<b>2.7</b>	<b>3.7</b>	<b>4.2</b>	100,000	2 <sup>A</sup>	-	-	-	-	1000	2	2	-
Iron	50		290	260	280	-	300	-	5000	-	-	300	300	-	-
Lead	0.50		<b>1.2</b>	<b>2.0</b>	<b>1.9</b>	5,000	1 <sup>A</sup>	-	200	100	10	-	1	2	10
Lithium	2.0		9.9	13	14	250,000	-	-	2500	-	-	-	-	-	-
Magnesium	100		30000	27000	28000	-	-	-	-	-	-	-	-	-	-
Manganese	2.0		<2.0	<2.0	<2.0	-	-	-	200	-	-	50	820	-	-
Molybdenum	2.0		19	38	43	5,000	73	-	-	500	-	-	73	-	70
Nickel	2.0		<2.0	<2.0	<2.0	20,000	25 <sup>A</sup>	-	200	1000	-	-	25	8.3	100
Potassium	100		14000	14000	14000	-	-	-	-	-	-	-	-	-	-
Selenium	1.0		<1.0	<1.0	<1.0	1,000	1	-	-	50	50	-	1.0	2	10
Silver	0.50		<b>&lt;0.50*</b>	<b>&lt;0.50*</b>	<b>&lt;0.50*</b>	5,000	0.1	-	-	-	-	-	0.1	1.5	100
Strontium	5.0		270	200	210	-	-	-	-	-	-	-	21000	-	4400
Thallium	0.10	<0.10	<0.10	<0.10	-	0.8	-	-	-	-	-	0.8	21.3	2	
Tin	2.0	<2.0	<2.0	<2.0	-	-	-	-	-	-	-	-	-	4400	
Uranium	0.10	1.0	0.89	1.1	2,000	15	-	10	200	20	-	300	100	20	
Vanadium	2.0	5.5	5.2	<b>6.3</b>	10,000	-	-	100	100	-	-	6	50	6.2	
Zinc	5.0	5.1	<5.0	<b>11</b>	500,000	30	-	5000 <sup>B</sup>	50000	-	5000	30	10	5000	

RDL = Laboratory's Reportable Detection Limit based on SPLP

"-" = no guideline available or not analyzed

<sup>A</sup> - As Hardness was not measured the most stringent guideline value for Copper and Lead was used.

<sup>B</sup> - value is determined through an equation. = 1000 µg/L when soil pH < 6.5; = 5000 µg/L when soil pH > 6.5

\*\*Operational Guidance Value for conventional treatment

\* detection limit is higher than one or more guideline.

**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**

Greyed Cells = Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills - Leachate

Highlighted = indicates value exceeds CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater and/or Marine)

Italics = Indicates value exceeds CCME Canadian Water Quality Guidelines for the Protection of Agriculture (Irrigation and/or Livestock)

Red numbering = Health Canada Guidelines for Canadian Drinking Water

Bold = Indicates value exceeds NSEQS Surface Water (Freshwater and / or Marine) guidelines

Underlined = Indicates value exceeds NSEQS Groundwater guidelines

Table A6 BTEX/TPH Results for Marine Sediments - Cripple Creek, Shelburne County, Nova Scotia

Sample ID	Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations					MTBE	Reached Baseline at C32	Resemblance		
			Benzene	Toluene	Ethylbenzene	Xylene	C <sub>4</sub> -C <sub>10</sub>	C <sub>10</sub> -C <sub>14</sub>	C <sub>14</sub> -C <sub>21</sub>	C <sub>21</sub> -C <sub>32</sub>	Modified TPH (Less BTEX)					
CC-1	25-Jun-15	mg/kg	<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	27	80	110	<0.025	Yes	Unidentified compound(s) in fuel oil range. Lube oil fraction.		
CC-2			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	44	110	130	<0.025	Yes	Unidentified compound(s) in fuel oil range. Lube oil fraction.		
CC-9			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	17	46	63	<0.025	Yes	Unidentified compound(s) in fuel oil range. Lube oil fraction.		
CC-10			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	<10	40	40	<0.025	Yes	Lube oil fraction.		
CC-10 Lab-Dup			n/a	n/a	n/a	n/a	n/a	<10	<10	39	n/a	n/a	n/a	n/a	n/a	
CC-11			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	42	100	130	<0.025	Yes	Unidentified compound(s) in fuel oil range. Lube oil fraction.		
CC-12			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	57	130	190	<0.025	Yes	Unidentified compound(s) in fuel oil range. Lube oil fraction.		
CC-13			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	<10	<15	<15	<0.025	n/a	n/a		
CC-14			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	<10	<15	<15	<0.025	n/a	n/a		
COMPOSITE A			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	44	110	160	<0.025	Yes	Unidentified compound(s) in fuel oil range. Lube oil fraction.		
COMPOSITE B			<0.0050	<0.0250	<0.010	<0.050	<2.5	<10	<10	<15	<15	<0.025	n/a	n/a		
RDL					0.0050	0.0250	0.010	0.050	2.5	10	10	15	15	0.025	-	-

Guidelines	Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil	No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)	MTBE
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Atlantic RBCA Tier I Version 3.0

Risk-Based Screening Levels for Soil

Land Use	Soil Type	Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil	No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)	
Agricultural/ Residential Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	8.8	-	-	-	74 (gas), 270 (fuel oil), 1100 (lube)
		Fine-Grained Soil	0.094	0.74	0.13	22	-	-	-	1900 (gas), 4700 (fuel oil), 10000 (lube)
	Non-Potable	Coarse-Grained Soil	0.099	77	30	8.8	-	-	-	74 (gas), 270 (fuel oil), 1100 (lube)
		Fine-Grained Soil	2.3	10000	9300	210	-	-	-	2100 (gas), 8600 (fuel oil), 10000 (lube)
Commercial/ Industrial Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	11	-	-	-	870 (gas), 1800 (fuel oil), 10000 (lube)
		Fine-Grained Soil	0.094	0.74	0.13	22	-	-	-	1900 (gas), 4700 (fuel oil), 10000 (lube)
	Non-Potable	Coarse-Grained Soil	2.5	10000	10000	110	-	-	-	870 (gas), 4000 (fuel oil), 10000 (lube)
		Fine-Grained Soil	33	10000	10000	10000	-	-	-	10000 (gas), 10000 (fuel oil), 10000 (lube)

Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life

Sediment Type	Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil	No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)
Typical <sup>a</sup>	1.2	1.4	1.2	1.3	-	-	-	15 (gas), 25 (fuel oil), 43 (lube oil)
Other <sup>b</sup>	5.4	6.1	5	5.5	-	-	-	67 (gas), 110 (fuel oil), 190 (lube oil)
Maximum	-	-	-	-	-	-	-	500 <sup>c</sup>

CCME Soil Quality Guidelines

Location	Soil Type	Benzene	Toluene	Ethylbenzene	Xylene
Residential Parkland	Surface (<= 1.5 m)	0.03	0.37	0.082	11.0
	Fine-Grained Soil	0.0068	0.08	0.018	2.4
Commercial, and Industrial (> 1.5 m)	Coarse-Grained Soil	0.03	0.37	0.082	11.0
	Fine-Grained Soil	0.0068	0.08	0.018	2.4

Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (2005)

Benzene	5	30	50	50	-	-	-	-
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Nova Scotia Environmental Quality Standards

Soils

Land Use	Soil Type	Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil	No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)	
Agricultural Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	8.8	-	-	-	74 (gas), 150 (fuel), 300 (lube)
		Fine-Grained Soil	0.094	0.74	0.13	22	-	-	-	210 (gas), 150 (fuel), 1300 (lube)
	Non-Potable	Coarse-Grained Soil	0.99	75	30	8.8	-	-	-	74 (gas), 150 (fuel), 300 (lube)
		Fine-Grained Soil	2.3	10000	120	65	-	-	-	210 (gas), 150 (fuel), 1300 (lube)
Residential/ Parkland Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	8.8	-	-	-	74 (gas), 270 (fuel), 1100 (lube)
		Fine-Grained Soil	0.094	0.74	0.13	22	-	-	-	1900 (gas), 4700 (fuel), 10,000 (lube)
	Non-Potable	Coarse-Grained Soil	0.99	77	30	8.8	-	-	-	74 (gas), 270 (fuel), 1100 (lube)
		Fine-Grained Soil	2.3	10000	9300	210	-	-	-	2100 (gas), 8600 (fuel), 10,000 (lube)
Commercial and Industrial Land Uses	Potable	Coarse-Grained Soil	0.042	0.35	0.065	11	-	-	-	870 (gas), 1,800 (fuel), 10,000 (lube)
		Fine-Grained Soil	0.094	0.74	0.13	22	-	-	-	1900 (gas), 4700 (fuel), 10,000 (lube)
	Non-Potable	Coarse-Grained Soil	2.5	10000	10000	110	-	-	-	870 (gas), 4000 (fuel oil), 10000 (lube)
		Fine-Grained Soil	33	10000	10000	10000	-	-	-	10,000 (gas, fuel or lube)

Sediment

Sediment Environment	Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil	No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)
Freshwater	1.2	1.4	1.2	1.3	-	-	-	15 (gas), 25 (fuel oil), 43 (lube)
Marine	1.2	1.4	1.2	1.3	-	-	-	15 (gas), 25 (fuel oil), 43 (lube)
Maximum	-	-	-	-	-	-	-	500 <sup>b</sup>

NOTE(S):  
 CCME Soil Quality Guidelines for benzene based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10<sup>-5</sup>).  
<sup>a</sup> - 'Typical' and 'Other' are defined in the Atlantic RBCA User Guidance document.  
<sup>b</sup> - This value does not change with sediment foc. While the product-specific screening values can vary with foc and could potentially exceed 500 mg/kg, this value represents the maximum screening level for Modified TPH, regardless of sediment foc. This Max TPH screening value is analogous to a management limit.  
**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**  
 Dotted Outline = Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life  
 Highlighted Orange = Atlantic RBCA Tier I Version 3.0: Risk-Based Screening Levels for Soil  
 Bold = CCME Soil Quality Guidelines: Surface  
 Red numbering = CCME Soil Quality Guidelines: Subsoil  
 Greyed Cells = Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills  
 Underline = Nova Scotia Environmental Quality Standards: Soils  
 Italicize = Nova Scotia Environmental Quality Standards: Sediments

Table A7 PCB, DDT and Pentachlorophenol Results for Marine Sediments - Cripple Creek, Shelburne County, Nova Scotia

Parameter	Units	Sample Identification and Date											CEPA Disposal of Sea Screening Criteria - Lower Level	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)	Nova Scotia Environmental Quality Standards																	
		CC-1	CC-2	CC-9	CC-10	CC-11	CC-11 Lab Dup	CC-12	CC-13	CC-14	COMPOSITE A	COMPOSITE B			Potable Site								Non-Potable Site					Sediment Environment				
		23-Jun-15													Fine-Grained Soils				Coarse-Grained Soils				Fine-Grained Soils	Coarse-Grained Soils	Fine- and Coarse-Grained Soils			Freshwater	Marine			
		Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use	Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use	Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use			Industrial Land Use	Agricultural Land Use	Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use	Freshwater	Marine										
<b>Polychlorinated Biphenyl (PCB) Results</b>																																
Aroclor 1016	mg/kg	<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Aroclor 1221		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Aroclor 1232		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Aroclor 1242		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1248		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1254		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1260		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1262		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1268		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dieldrin		<0.020*	<0.025*	<0.003	<0.015*	<0.025*	<0.025*	<0.03*	<0.002	<0.003	<0.025*	<0.002	-	-	0.055	0.59	0.59	0.59	0.044	1.1	1.1	1.1	0.055	0.044	3.4	5.1	44	0.00667	0.0043	-	-	
Total PCB Concentration	<0.15*	<0.20*	<0.023	<0.11*	<0.2*	N/A	<0.23*	<0.015	<0.023	<0.20*	<0.015	0.1	50	1.3	22	33	33	1.3	22	33	33	1.3	1.3	22	33	33	33	33	0.277	0.189	-	
Pentachlorophenol	<1	<2	<1	<0.5	<1	<1	<2	<0.05	<0.5	<2	<0.5	-	10	7.6	7.6	7.6	7.6	7.6	7.6	7.6	11	11	93	340	1300	0.1	0.1	-	-	-		
<b>Dichloro-Diphenyl-Trichloroethane (DDT) Results</b>																																
p,p-DDE	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDE	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDD	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDD	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDT	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDT	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDT + p,p-DDT	<0.020	<0.025	<0.003	<0.015	<0.025	N/A	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDD + p,p-DDD	<0.020	<0.025	<0.003	<0.015	<0.025	N/A	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
p,p-DDE + p,p-DDE	<0.020	<0.025	<0.003	<0.015	<0.025	N/A	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total DDT (calculated)	<0.020*	<0.025*	<0.003	<0.015*	<0.025*	<0.025*	<0.030*	<0.002	<0.003	<0.025*	<0.025*	-	-	0.7	220	340	1600	0.7	220	340	1600	0.7	0.7	220	340	1600	0.00477	0.00477	-	-	-	

NOTE(s):

OC Pesticide Analysis: Due to the sample matrix, some samples required dilution. Detection limits were adjusted accordingly. Detection limits were adjusted for high moisture content.

**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**

- Dotted Outline** = CEPA Disposal of Sea Screening Criteria
- Highlighted Orange** = CCME Sediment Quality Guidelines: Interim Sediment Quality Guidelines
- Underline** = CCME Sediment Quality Guidelines: Probable Effects Levels
- Bold** = CCME Soil Quality Guidelines: Human Health (including IACR index)
- Red numbering** = CCME Soil Quality Guidelines: Environmental Health
- Greyed Cells** = Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills
- Italicize** = Nova Scotia Environmental Quality Standards - Soils
- Blue outline** = Nova Scotia Environmental Quality Standards - Sediments

Table A7 PCB, DDT and Pentachlorophenol Results for Marine Sediments - Cripple Creek, Shelburne County, Nova Scotia

Parameter	Units	Sample Identification and Date											CCME Sediment Quality Guidelines for Aquatic Life				CCME Soil Quality Guidelines for the Protection of Environmental and Human Health			
		CC-1	CC-2	CC-9	CC-10	CC-11	CC-11 Lab Dup	CC-12	CC-13	CC-14	COMPOSITE A	COMPOSITE B	Freshwater		Marine		Agricultural Land Use	Residential/Parkland Land Use	Commerical Land Use	Industrial Land Use
		23-Jun-15											ISQG	PEL	ISQC	PEL				
<b>Polychlorinated Biphenyl (PCB) Results</b>																				
Aroclor 1016	mg/kg	<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Aroclor 1221		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Aroclor 1232		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Aroclor 1242		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Aroclor 1248		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Aroclor 1254		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	60	340	63.3	709	-	-	-	-
Aroclor 1260		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Aroclor 1262		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Aroclor 1268		<0.15	<0.20	<0.023	<0.11	<0.2	<0.2	<0.23	<0.015	<0.023	<0.20	<0.015	-	-	-	-	-	-	-	-
Dieldrin		<0.020*	<0.025*	<0.003	<0.015*	<0.025*	<0.025*	<0.03*	<0.002	<0.003	<0.025*	<0.002	2.85	6.67	0.71	4.3	-	-	-	-
Total PCB Concentration		<0.15*	<0.20*	<0.023	<0.11*	<0.2*	N/A	<0.23*	<0.015	<0.023	<0.20*	<0.015	34.1	227	21.5	189	0.5	1.3	33	33
Pentachlorophenol		<1	<2	<1	<0.5	<1	<1	<2	<0.05	<0.5	<2	<0.5	-	-	-	-	7.6	7.6	7.6	7.6
<b>Dichloro-Diphenyl-Trichloroethane (DDT) Results</b>																				
o,p-DDE	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
p,p-DDE	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
o,p-DDD	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
p,p-DDD	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
o,p-DDT	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
p,p-DDT	<0.020	<0.025	<0.003	<0.015	<0.025	<0.025	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
o,p-DDT + p,p-DDT	<0.020	<0.025	<0.003	<0.015	<0.025	N/A	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
o,p-DDD + p,p-DDD	<0.020	<0.025	<0.003	<0.015	<0.025	N/A	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
o,p-DDE + p,p-DDE	<0.020	<0.025	<0.003	<0.015	<0.025	N/A	<0.030	<0.002	<0.003	<0.025	<0.025	-	-	-	-	-	-	-	-	
Total DDT (calculated)	<0.020*	<0.025*	<0.003	<0.015*	<0.025*	<0.025*	<0.030*	<0.002	<0.003	<0.025*	<0.025*	1.19	4.77	1.19	4.77	0.7	0.7	12	12	

NOTE(s):

OC Pesticide Analysis: Due to the sample matrix, some samples required dilution. Detection limits were adjusted accordingly. Detection limits were adjusted for high moisture content.

**EXCEEDANCES - coding below indicates that results exceeds one or more guidelines in the following groups:**

- \*Dotted Outline = CFFA Disposal of Soils Screening Criteria
- Highlighted Orange = CCME Sediment Quality Guidelines: Interim Sediment Quality Guidelines
- Underline = CCME Sediment Quality Guidelines: Probable Effects Levels
- Bold = CCME Soil Quality Guidelines: Human Health (including IACR index)
- Red numbering = CCME Soil Quality Guidelines: Environmental Health
- Greyed Cells = Nova Scotia Guidelines for Disposal of Contaminated Soils in Landfills
- Italicize = Nova Scotia Environmental Quality Standards - Soils
- Blue outline = Nova Scotia Environmental Quality Standards - Sediments

**FINAL REPORT - MARINE SEDIMENT SAMPLING PROGRAM: CRIPPLE CREEK DFO-SCH,  
SHELburnE COUNTY, NOVA SCOTIA**

September 4, 2015

**Appendix B : Laboratory Results**

Your Project #: 121413541  
Site Location: CRIPPLE CREEK  
Your C.O.C. #: N/A

**Attention:Kelley Fraser**

Stantec Consulting Ltd  
40 Highfield Park Drive  
Suite 102  
Dartmouth, NS  
B3A 0A3

**Report Date: 2015/07/20**

Report #: R3579389

Version: 4 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B5C3479**

**Received: 2015/06/25, 12:54**

Sample Matrix: Soil  
# Samples Received: 10

Analyses	Quantity	Date	Date	Laboratory Method	Reference
		Extracted	Analyzed		
Boron Solid MS - Hot Water Soluble	10	2015/07/02	2015/07/02	ATL SOP 00058	EPA 6020A R1 m
Acid Extractables by GC/MS (1)	10	2015/07/07	2015/07/08	CAM SOP-00332	EPA 8270D m
Hexavalent Chromium in Soil by IC (1, 2)	10	2015/07/04	2015/07/05	CAM SOP-00436	EPA 3060/7199 m
TEH in Soil (PIRI) (2)	10	2015/06/30	2015/07/01	ATL SOP 00111	Atl. PIRI v3 m
Metals Leach, SPLP Extraction	3	2015/07/08	2015/07/09	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS	10	2015/07/02	2015/07/02	ATL SOP 00058	EPA 6020A R1 m
Moisture	10	N/A	2015/06/30	ATL SOP 00001	OMOE Handbook 1983 m
OC Pesticides (Selected) & PCB (1, 3)	10	2015/07/07	2015/07/09	CAM SOP-00307	SW846 8081, 8082
OC Pesticides Summed Parameters (1)	10	N/A	2015/06/30	CAM SOP-00307	EPA 8081/8082 m
PAH in Leachates GC/MS (Low Level)	5	2015/07/14	2015/07/17	ATL SOP 00103	EPA 8270D 2007 m
PAH in sediment by GC/MS (Low Level) (2)	10	2015/06/30	2015/07/01	ATL SOP 00102	EPA 8270D 2007 m
VPH in Soil - Low Level	8	2015/06/27	2015/07/01	ATL SOP 00119	Atl. PIRI v3 m
VPH in Soil - Low Level	1	2015/06/27	2015/07/02	ATL SOP 00119	Atl. PIRI v3 m
VPH in Soil - Low Level	1	2015/06/30	2015/07/01	ATL SOP 00119	Atl. PIRI v3 m
Particle size in solids (pipette&sieve) (4)	10	N/A	2015/07/10	ATL SOP 00012	MSAMS 1978 m
SPLP Inorganic extraction - pH	5	N/A	2015/07/08	ATL SOP 00036	EPA 1312 m
SPLP Inorganic extraction - Weight	5	N/A	2015/07/08	ATL SOP 00036	EPA 1312 m
Total Carbon in Solids by Ind.	10	2015/07/02	2015/07/03	ATL SOP 00044/00045	LECO 203-601-224 m
TIC in soil	10	2015/06/25	2015/07/03	ATL SOP 00044/00045	LECO 203-601-224 m
Total Organic Carbon in Soil	1	2015/07/02	2015/07/02	ATL SOP 00044/00045	LECO 203-601-224 m
Total Organic Carbon in Soil	1	2015/07/02	2015/07/03	ATL SOP 00044/00045	LECO 203-601-224 m
Total Organic Carbon in Soil	8	2015/07/03	2015/07/03	ATL SOP 00044/00045	LECO 203-601-224 m
ModTPH (T1) Calc. for Soil	9	N/A	2015/07/02	N/A	Atl. PIRI v3 m
ModTPH (T1) Calc. for Soil	1	N/A	2015/07/03	N/A	Atl. PIRI v3 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Analytics Mississauga

(2) Soils are reported on a dry weight basis unless otherwise specified.

(3) Chlordane ( Total) = Alpha Chlordane + Gamma Chlordane

(4) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.

Your Project #: 121413541  
Site Location: CRIPPLE CREEK  
Your C.O.C. #: N/A

**Attention:Kelley Fraser**

Stantec Consulting Ltd  
40 Highfield Park Drive  
Suite 102  
Dartmouth, NS  
B3A 0A3

**Report Date: 2015/07/20**  
Report #: R3579389  
Version: 4 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B5C3479**  
**Received: 2015/06/25, 12:54**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.  
Leonard Muise, Project Manager  
Email: LMuise@maxxam.ca  
Phone# (902)420-0203 Ext:236

=====  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**RBCA HYDROCARBONS (LOW LEVEL)**

Maxxam ID		ANB682	ANB683	ANB684	ANB685	ANB686		
Sampling Date		2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23		
	Units	COMPOSITE A	COMPOSITE B	CC-1	CC-2	CC-9	RDL	QC Batch
<b>Inorganics</b>								
Moisture	%	63	20	45	60	37	1.0	4085466
<b>Petroleum Hydrocarbons</b>								
Methyl t-butyl ether (MTBE)	mg/kg	ND	ND	ND	ND	ND	0.025	4086922
Benzene	mg/kg	ND	ND	ND	ND	ND	0.0050	4086922
Toluene	mg/kg	ND	ND	ND	ND	ND	0.025	4086922
Ethylbenzene	mg/kg	ND	ND	ND	ND	ND	0.010	4086922
Total Xylenes	mg/kg	ND	ND	ND	ND	ND	0.050	4086922
C6 - C10 (less BTEX)	mg/kg	ND	ND	ND	ND	ND	2.5	4086922
>C10-C16 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	10	4086483
>C16-C21 Hydrocarbons	mg/kg	44	ND	27	44	17	10	4086483
>C21-<C32 Hydrocarbons	mg/kg	110	ND	80	110	46	15	4086483
Modified TPH (Tier1)	mg/kg	160	ND	110	150	63	15	4080767
Reached Baseline at C32	mg/kg	Yes	NA	Yes	Yes	Yes	N/A	4086483
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	NA	COMMENT (1)	COMMENT (1)	COMMENT (1)	N/A	4086483
<b>Surrogate Recovery (%)</b>								
Isobutylbenzene - Extractable	%	97	98	93	97	95	N/A	4086483
n-Dotriacontane - Extractable	%	92	91	91	94	91	N/A	4086483
Isobutylbenzene - Volatile	%	122	123	133 (2)	123	126	N/A	4086922
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected N/A = Not Applicable (1) Unidentified compound(s) in fuel oil range. Lube oil fraction. (2) VPH surrogate within reference method acceptance limits.								

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**RBCA HYDROCARBONS (LOW LEVEL)**

Maxxam ID		ANB687	ANB687	ANB688	ANB689		ANB690		
Sampling Date		2015/06/23	2015/06/23	2015/06/23	2015/06/23		2015/06/24		
	Units	CC-10	CC-10 Lab-Dup	CC-11	CC-12	QC Batch	CC-13	RDL	QC Batch
<b>Inorganics</b>									
Moisture	%	35	N/A	59	63	4085466	19	1.0	4085466
<b>Petroleum Hydrocarbons</b>									
Methyl t-butyl ether (MTBE)	mg/kg	ND	N/A	ND	ND	4086922	ND	0.025	4086922
Benzene	mg/kg	ND	N/A	ND	ND	4086922	ND	0.0050	4086922
Toluene	mg/kg	ND	N/A	ND	ND	4086922	ND	0.025	4086922
Ethylbenzene	mg/kg	ND	N/A	ND	ND	4086922	ND	0.010	4086922
Total Xylenes	mg/kg	ND	N/A	ND	ND	4086922	ND	0.050	4086922
C6 - C10 (less BTEX)	mg/kg	ND	N/A	ND	ND	4086922	ND	2.5	4086922
>C10-C16 Hydrocarbons	mg/kg	ND	ND	ND	ND	4086483	ND	10	4086483
>C16-C21 Hydrocarbons	mg/kg	ND	ND	42	57	4086483	ND	10	4086483
>C21-<C32 Hydrocarbons	mg/kg	40	39	100	130	4086483	ND	15	4086483
Modified TPH (Tier1)	mg/kg	40	N/A	150	190	4080767	ND	15	4081728
Reached Baseline at C32	mg/kg	Yes	N/A	Yes	Yes	4086483	NA	N/A	4086483
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	N/A	COMMENT (2)	COMMENT (2)	4086483	NA	N/A	4086483
<b>Surrogate Recovery (%)</b>									
Isobutylbenzene - Extractable	%	93	91	95	93	4086483	97	N/A	4086483
n-Dotriacontane - Extractable	%	89	88	93	94	4086483	94	N/A	4086483
Isobutylbenzene - Volatile	%	124	N/A	128	124	4086922	110	N/A	4086922
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable ND = Not detected (1) Lube oil fraction. (2) Unidentified compound(s) in fuel oil range. Lube oil fraction.									

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**RBCA HYDROCARBONS (LOW LEVEL)**

Maxxam ID		ANB691		
Sampling Date		2015/06/24		
	<b>Units</b>	<b>CC-14</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Inorganics</b>				
Moisture	%	33	1.0	4085466
<b>Petroleum Hydrocarbons</b>				
Methyl t-butyl ether (MTBE)	mg/kg	ND	0.025	4088447
Benzene	mg/kg	ND	0.0050	4088447
Toluene	mg/kg	ND	0.025	4088447
Ethylbenzene	mg/kg	ND	0.010	4088447
Total Xylenes	mg/kg	ND	0.050	4088447
C6 - C10 (less BTEX)	mg/kg	ND	2.5	4088447
>C10-C16 Hydrocarbons	mg/kg	ND	10	4086483
>C16-C21 Hydrocarbons	mg/kg	ND	10	4086483
>C21-<C32 Hydrocarbons	mg/kg	ND	15	4086483
Modified TPH (Tier1)	mg/kg	ND	15	4081728
Reached Baseline at C32	mg/kg	NA	N/A	4086483
Hydrocarbon Resemblance	mg/kg	NA	N/A	4086483
<b>Surrogate Recovery (%)</b>				
Isobutylbenzene - Extractable	%	98	N/A	4086483
n-Dotriacontane - Extractable	%	97	N/A	4086483
Isobutylbenzene - Volatile	%	106	N/A	4088447
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected N/A = Not Applicable				

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ATLANTIC SPLP LEACHATE + ICP-MS METALS (SOIL)**

Maxxam ID		ANB685	ANB688	ANB689		
Sampling Date		2015/06/23	2015/06/23	2015/06/23		
	Units	CC-2	CC-11	CC-12	RDL	QC Batch
<b>Charge/Prep Analysis</b>						
Sample Weight (as received)	g	100	100	100	N/A	4095855
Final pH	N/A	8.25	8.23	8.18	N/A	4095856
<b>Metals</b>						
Leachable Aluminum (Al)	ug/L	230	220	260	10	4096214
Leachable Antimony (Sb)	ug/L	ND	ND	ND	2.0	4096214
Leachable Arsenic (As)	ug/L	4.7	3.4	4.3	2.0	4096214
Leachable Barium (Ba)	ug/L	39	33	120	5.0	4096214
Leachable Beryllium (Be)	ug/L	ND	ND	ND	2.0	4096214
Leachable Cadmium (Cd)	ug/L	ND	ND	ND	0.30	4096214
Leachable Calcium (Ca)	ug/L	24000	19000	20000	100	4096214
Leachable Chromium (Cr)	ug/L	ND	ND	ND	2.0	4096214
Leachable Cobalt (Co)	ug/L	ND	ND	ND	1.0	4096214
Leachable Copper (Cu)	ug/L	2.7	3.7	4.2	2.0	4096214
Leachable Iron (Fe)	ug/L	290	260	280	50	4096214
Leachable Lead (Pb)	ug/L	1.2	2.0	1.9	0.50	4096214
Leachable Lithium (Li)	ug/L	9.9	13	14	2.0	4096214
Leachable Magnesium (Mg)	ug/L	30000	27000	28000	100	4096214
Leachable Manganese (Mn)	ug/L	ND	ND	ND	2.0	4096214
Leachable Molybdenum (Mo)	ug/L	19	38	43	2.0	4096214
Leachable Nickel (Ni)	ug/L	ND	ND	ND	2.0	4096214
Leachable Potassium (K)	ug/L	14000	14000	14000	100	4096214
Leachable Selenium (Se)	ug/L	ND	ND	ND	1.0	4096214
Leachable Silver (Ag)	ug/L	ND	ND	ND	0.50	4096214
Leachable Strontium (Sr)	ug/L	270	200	210	5.0	4096214
Leachable Thallium (Tl)	ug/L	ND	ND	ND	0.10	4096214
Leachable Tin (Sn)	ug/L	ND	ND	ND	2.0	4096214
Leachable Uranium (U)	ug/L	1.0	0.89	1.1	0.10	4096214
Leachable Vanadium (V)	ug/L	5.5	5.2	6.3	2.0	4096214
Leachable Zinc (Zn)	ug/L	5.1	ND	11	5.0	4096214
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable ND = Not detected						

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ATLANTIC SPLP LEACHATE ONLY (SOIL)**

Maxxam ID		ANB682	ANB682	ANB684	
Sampling Date		2015/06/23	2015/06/23	2015/06/23	
	<b>Units</b>	<b>COMPOSITE A</b>	<b>COMPOSITE A Lab-Dup</b>	<b>CC-1</b>	<b>QC Batch</b>
<b>Charge/Prep Analysis</b>					
Sample Weight (as received)	g	100	100	100	4095855
Final pH	N/A	8.29	8.24	8.18	4095856
QC Batch = Quality Control Batch					
Lab-Dup = Laboratory Initiated Duplicate					

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ATLANTIC TOTAL ORGANIC/INORGANIC CARBON (SOIL)**

Maxxam ID		ANB682			ANB683			ANB684		ANB685		
Sampling Date		2015/06/23			2015/06/23			2015/06/23		2015/06/23		
	<b>Units</b>	<b>COMPOSITE A</b>	<b>RDL</b>	<b>QC Batch</b>	<b>COMPOSITE B</b>	<b>RDL</b>	<b>QC Batch</b>	<b>CC-1</b>	<b>RDL</b>	<b>CC-2</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Inorganics</b>												
Total Inorganic Carbon (C)	g/kg	18	0.70	4081727	10	0.70	4081727	4.6	0.80	10	0.70	4081727
Organic Carbon (TOC)	g/kg	29	0.50	4088592	3.3	0.20	4090416	12	0.80	42	0.60	4090416
Total Carbon-combustion IR	g/kg	47	0.70	4089291	13	0.70	4089291	17	0.70	53	0.70	4089318

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam ID		ANB685		ANB686		ANB687		ANB688		ANB689		
Sampling Date		2015/06/23		2015/06/23		2015/06/23		2015/06/23		2015/06/23		
	<b>Units</b>	<b>CC-2 Lab-Dup</b>	<b>RDL</b>	<b>CC-9</b>	<b>RDL</b>	<b>CC-10</b>	<b>RDL</b>	<b>CC-11</b>	<b>RDL</b>	<b>CC-12</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Inorganics</b>												
Total Inorganic Carbon (C)	g/kg	N/A	0.70	3.9	0.60	2.6	0.70	4.0	1.0	4.2	0.70	4081727
Organic Carbon (TOC)	g/kg	43	0.60	12	0.60	13	0.70	40	1.0	39	0.60	4090416
Total Carbon-combustion IR	g/kg	N/A	0.70	16	0.30	15	0.30	44	0.70	43	0.70	4089318

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

N/A = Not Applicable

Maxxam ID		ANB690		ANB691		
Sampling Date		2015/06/24		2015/06/24		
	<b>Units</b>	<b>CC-13</b>	<b>RDL</b>	<b>CC-14</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Inorganics</b>						
Total Inorganic Carbon (C)	g/kg	6.2	0.70	1.6	0.30	4081727
Organic Carbon (TOC)	g/kg	1.5	0.40	2.5	0.20	4090416
Total Carbon-combustion IR	g/kg	7.7	0.70	4.1	0.30	4089318

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**RESULTS OF ANALYSES OF SOIL**

Maxxam ID		ANB682	ANB682	ANB683	ANB684	ANB685	ANB686	ANB687		
Sampling Date		2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23		
	Units	COMPOSITE A	COMPOSITE A Lab-Dup	COMPOSITE B	CC-1	CC-2	CC-9	CC-10	RDL	QC Batch

<b>Inorganics</b>										
Chromium (VI)	ug/g	ND	N/A	ND	ND	ND	ND	ND	0.2	4092138
< -1 Phi (2 mm)	%	100	99	100	100	100	100	100	0.10	4086856
< 0 Phi (1 mm)	%	95	94	99	99	94	99	99	0.10	4086856
< +1 Phi (0.5 mm)	%	90	90	89	98	89	98	96	0.10	4086856
< +2 Phi (0.25 mm)	%	84	86	60	78	83	89	82	0.10	4086856
< +3 Phi (0.12 mm)	%	61	64	16	22	61	44	44	0.10	4086856
< +4 Phi (0.062 mm)	%	49	52	8.6	18	50	30	31	0.10	4086856
< +5 Phi (0.031 mm)	%	37	38	5.2	15	40	19	23	0.10	4086856
< +6 Phi (0.016 mm)	%	20	22	3.4	8.7	24	12	10	0.10	4086856
< +7 Phi (0.0078 mm)	%	14	15	2.6	6.4	18	8.0	7.4	0.10	4086856
< +8 Phi (0.0039 mm)	%	13	13	2.5	6.4	16	7.2	6.5	0.10	4086856
< +9 Phi (0.0020 mm)	%	11	11	2.6	5.8	14	6.4	5.9	0.10	4086856
Gravel	%	0.10	0.61 (1)	ND	ND	ND	ND	0.17	0.10	4086856
Sand	%	51	48	91	82	50	70	69	0.10	4086856
Silt	%	36	38	6.0	11	34	23	25	0.10	4086856
Clay	%	13	13	2.5	6.4	16	7.2	6.5	0.10	4086856

RDL = Reportable Detection Limit  
 QC Batch = Quality Control Batch  
 Lab-Dup = Laboratory Initiated Duplicate  
 ND = Not detected  
 N/A = Not Applicable  
 (1) PSA: %RPD acceptable. Duplicate values agree within 10% absolute.

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**RESULTS OF ANALYSES OF SOIL**

Maxxam ID		ANB688	ANB689	ANB690	ANB691		
Sampling Date		2015/06/23	2015/06/23	2015/06/24	2015/06/24		
	Units	CC-11	CC-12	CC-13	CC-14	RDL	QC Batch
<b>Inorganics</b>							
Chromium (VI)	ug/g	ND	ND	ND	ND	0.2	4092138
< -1 Phi (2 mm)	%	94	100	100	100	0.10	4086856
< 0 Phi (1 mm)	%	90	95	100	100	0.10	4086856
< +1 Phi (0.5 mm)	%	87	91	99	99	0.10	4086856
< +2 Phi (0.25 mm)	%	82	87	80	95	0.10	4086856
< +3 Phi (0.12 mm)	%	73	78	11	47	0.10	4086856
< +4 Phi (0.062 mm)	%	60	66	3.1	24	0.10	4086856
< +5 Phi (0.031 mm)	%	44	57	2.0	7.5	0.10	4086856
< +6 Phi (0.016 mm)	%	24	34	1.6	3.3	0.10	4086856
< +7 Phi (0.0078 mm)	%	16	20	1.6	2.7	0.10	4086856
< +8 Phi (0.0039 mm)	%	14	17	1.6	2.7	0.10	4086856
< +9 Phi (0.0020 mm)	%	11	14	1.9	2.7	0.10	4086856
Gravel	%	6.0	ND	ND	ND	0.10	4086856
Sand	%	34	34	97	76	0.10	4086856
Silt	%	47	50	1.5	21	0.10	4086856
Clay	%	14	17	1.6	2.7	0.10	4086856
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
ND = Not detected							

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ELEMENTS BY ICP/MS (SOIL)**

Maxxam ID		ANB682	ANB683	ANB684	ANB685	ANB686	ANB687	ANB688		
Sampling Date		2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23		
	Units	COMPOSITE A	COMPOSITE B	CC-1	CC-2	CC-9	CC-10	CC-11	RDL	QC Batch
<b>Metals</b>										
Soluble (Hot Water) Boron (B)	mg/kg	23	5.2	12	29	9.1	11	28	3.0	4087046
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										

Maxxam ID		ANB689		ANB690		ANB691		
Sampling Date		2015/06/23		2015/06/24		2015/06/24		
	Units	CC-12	RDL	CC-13	RDL	CC-14	RDL	QC Batch
<b>Metals</b>								
Soluble (Hot Water) Boron (B)	mg/kg	26	3.0	2.6	0.30	6.1	3.0	4087046
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)**

Maxxam ID		ANB682	ANB683	ANB684	ANB685	ANB686	ANB687		
Sampling Date		2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23	2015/06/23		
	Units	COMPOSITE A	COMPOSITE B	CC-1	CC-2	CC-9	CC-10	RDL	QC Batch

<b>Metals</b>									
Acid Extractable Aluminum (Al)	mg/kg	5900	2400	3400	6500	3900	4200	10	4088619
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	ND	2.0	4088619
Acid Extractable Arsenic (As)	mg/kg	3.2	ND	ND	4.8	2.4	2.9	2.0	4088619
Acid Extractable Barium (Ba)	mg/kg	25	11	14	27	18	18	5.0	4088619
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	ND	2.0	4088619
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	ND	ND	2.0	4088619
Acid Extractable Boron (B)	mg/kg	55	ND	ND	77	ND	ND	50	4088619
Acid Extractable Cadmium (Cd)	mg/kg	0.50	ND	ND	0.53	ND	ND	0.30	4088619
Acid Extractable Chromium (Cr)	mg/kg	14	5.6	8.3	16	8.8	9.8	2.0	4088619
Acid Extractable Cobalt (Co)	mg/kg	3.3	1.3	1.8	3.5	2.1	2.3	1.0	4088619
Acid Extractable Copper (Cu)	mg/kg	8.7	ND	4.4	11	4.8	5.9	2.0	4088619
Acid Extractable Iron (Fe)	mg/kg	9700	3900	5500	11000	6000	6900	50	4088619
Acid Extractable Lead (Pb)	mg/kg	8.5	1.4	5.7	11	5.5	6.8	0.50	4088619
Acid Extractable Lithium (Li)	mg/kg	15	6.9	9.1	16	10	12	2.0	4088619
Acid Extractable Manganese (Mn)	mg/kg	120	55	72	130	86	93	2.0	4088619
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	ND	0.10	4088619
Acid Extractable Molybdenum (Mo)	mg/kg	3.0	ND	ND	2.4	ND	ND	2.0	4088619
Acid Extractable Nickel (Ni)	mg/kg	10	3.4	5.5	11	5.7	6.5	2.0	4088619
Acid Extractable Rubidium (Rb)	mg/kg	12	5.1	6.6	13	7.9	8.5	2.0	4088619
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	ND	1.0	4088619
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	ND	ND	0.50	4088619
Acid Extractable Strontium (Sr)	mg/kg	100	47	31	120	18	24	5.0	4088619
Acid Extractable Thallium (Tl)	mg/kg	0.40	ND	0.11	0.20	0.12	0.12	0.10	4088619
Acid Extractable Tin (Sn)	mg/kg	ND	ND	ND	ND	ND	ND	1.0	4088619
Acid Extractable Uranium (U)	mg/kg	1.1	0.29	0.53	1.0	0.57	0.71	0.10	4088619
Acid Extractable Vanadium (V)	mg/kg	16	5.5	8.4	18	9.7	11	2.0	4088619
Acid Extractable Zinc (Zn)	mg/kg	34	10	24	45	29	23	5.0	4088619

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
ND = Not detected

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)**

Maxxam ID		ANB688	ANB689	ANB690	ANB691		
Sampling Date		2015/06/23	2015/06/23	2015/06/24	2015/06/24		
	Units	CC-11	CC-12	CC-13	CC-14	RDL	QC Batch
<b>Metals</b>							
Acid Extractable Aluminum (Al)	mg/kg	8200	8700	1800	3100	10	4088619
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	2.0	4088619
Acid Extractable Arsenic (As)	mg/kg	4.6	5.2	ND	ND	2.0	4088619
Acid Extractable Barium (Ba)	mg/kg	33	34	7.2	16	5.0	4088619
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	2.0	4088619
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	2.0	4088619
Acid Extractable Boron (B)	mg/kg	66	66	ND	ND	50	4088619
Acid Extractable Cadmium (Cd)	mg/kg	0.59	0.64	ND	ND	0.30	4088619
Acid Extractable Chromium (Cr)	mg/kg	20	21	3.9	6.7	2.0	4088619
Acid Extractable Cobalt (Co)	mg/kg	4.4	4.7	ND	1.7	1.0	4088619
Acid Extractable Copper (Cu)	mg/kg	17	18	ND	ND	2.0	4088619
Acid Extractable Iron (Fe)	mg/kg	13000	14000	2800	4700	50	4088619
Acid Extractable Lead (Pb)	mg/kg	18	19	0.98	2.2	0.50	4088619
Acid Extractable Lithium (Li)	mg/kg	22	23	4.9	8.3	2.0	4088619
Acid Extractable Manganese (Mn)	mg/kg	160	170	46	78	2.0	4088619
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	0.10	4088619
Acid Extractable Molybdenum (Mo)	mg/kg	3.6	4.3	ND	ND	2.0	4088619
Acid Extractable Nickel (Ni)	mg/kg	14	14	2.4	3.9	2.0	4088619
Acid Extractable Rubidium (Rb)	mg/kg	16	17	3.4	6.6	2.0	4088619
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	1.0	4088619
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	0.50	4088619
Acid Extractable Strontium (Sr)	mg/kg	55	49	27	10	5.0	4088619
Acid Extractable Thallium (Tl)	mg/kg	0.23	0.23	ND	ND	0.10	4088619
Acid Extractable Tin (Sn)	mg/kg	2.7	2.2	ND	ND	1.0	4088619
Acid Extractable Uranium (U)	mg/kg	1.5	1.8	0.22	0.61	0.10	4088619
Acid Extractable Vanadium (V)	mg/kg	21	23	4.1	7.1	2.0	4088619
Acid Extractable Zinc (Zn)	mg/kg	50	53	7.1	13	5.0	4088619
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
ND = Not detected							

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		ANB682		ANB682	ANB683		ANB684		
Sampling Date		2015/06/23		2015/06/23	2015/06/23		2015/06/23		
	Units	COMPOSITE A	RDL	COMPOSITE A Lab-Dup	COMPOSITE B	RDL	CC-1	RDL	QC Batch

<b>Polyaromatic Hydrocarbons</b>									
Leachable 1-Methylnaphthalene	ug/L	0.032	0.020	0.025	N/A	0.020	ND	0.010	4103485
Leachable 2-Methylnaphthalene	ug/L	0.045	0.020	0.036	N/A	0.020	0.011	0.010	4103485
Leachable Acenaphthene	ug/L	0.12	0.0060	0.094	N/A	0.0070	0.051	0.0050	4103485
Leachable Acenaphthylene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Anthracene	ug/L	0.021	0.0060	0.017	N/A	0.0070	0.030	0.0050	4103485
Leachable Benzo(a)anthracene	ug/L	ND	0.0060	ND	N/A	0.0070	0.0080	0.0050	4103485
Leachable Benzo(a)pyrene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Benzo(b)fluoranthene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Benzo(g,h,i)perylene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Benzo(j)fluoranthene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Benzo(k)fluoranthene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Chrysene	ug/L	ND	0.0060	ND	N/A	0.0070	0.0098	0.0050	4103485
Leachable Dibenz(a,h)anthracene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Fluoranthene	ug/L	0.085	0.0060	0.084	N/A	0.0070	0.20	0.0050	4103485
Leachable Fluorene	ug/L	0.086	0.0060	0.074	N/A	0.0070	0.074	0.0050	4103485
Leachable Indeno(1,2,3-cd)pyrene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Naphthalene	ug/L	0.051	0.030	ND	N/A	0.030	ND	0.020	4103485
Leachable Perylene	ug/L	ND	0.0060	ND	N/A	0.0070	ND	0.0050	4103485
Leachable Phenanthrene	ug/L	0.069	0.0060	0.066	N/A	0.0070	0.085	0.0050	4103485
Leachable Pyrene	ug/L	0.039	0.0060	0.057	N/A	0.0070	0.088	0.0050	4103485
1-Methylnaphthalene	mg/kg	ND	0.0050	ND	ND	0.0050	ND	0.0050	4086510
2-Methylnaphthalene	mg/kg	ND	0.0050	ND	ND	0.0050	ND	0.0050	4086510
Acenaphthene	mg/kg	0.030	0.0050	0.027	ND	0.0050	ND	0.0050	4086510
Acenaphthylene	mg/kg	ND	0.0050	ND	ND	0.0050	0.0096	0.0050	4086510
Anthracene	mg/kg	0.12	0.0050	0.13	ND	0.0050	0.069	0.0050	4086510
Benzo(a)anthracene	mg/kg	0.25	0.0050	0.29	ND	0.0050	0.20	0.0050	4086510
Benzo(a)pyrene	mg/kg	0.23	0.0050	0.27	ND	0.0050	0.18	0.0050	4086510
Benzo(b)fluoranthene	mg/kg	0.33	0.0050	0.30	ND	0.0050	0.29	0.0050	4086510
Benzo(g,h,i)perylene	mg/kg	0.12	0.0050	0.13	ND	0.0050	0.10	0.0050	4086510
Benzo(j)fluoranthene	mg/kg	0.17	0.0050	0.17	ND	0.0050	0.14	0.0050	4086510
Benzo(k)fluoranthene	mg/kg	0.18	0.0050	0.17	ND	0.0050	0.14	0.0050	4086510
Chrysene	mg/kg	0.40	0.0050	0.47	ND	0.0050	0.42	0.0050	4086510

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
Lab-Dup = Laboratory Initiated Duplicate  
N/A = Not Applicable  
ND = Not detected

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		ANB682		ANB682	ANB683		ANB684		
Sampling Date		2015/06/23		2015/06/23	2015/06/23		2015/06/23		
	Units	COMPOSITE A	RDL	COMPOSITE A Lab-Dup	COMPOSITE B	RDL	CC-1	RDL	QC Batch
Dibenz(a,h)anthracene	mg/kg	0.035	0.0050	0.039	ND	0.0050	0.031	0.0050	4086510
Fluoranthene	mg/kg	0.80	0.0050	0.79	0.010	0.0050	0.46	0.0050	4086510
Fluorene	mg/kg	0.045	0.0050	0.050	ND	0.0050	0.022	0.0050	4086510
Indeno(1,2,3-cd)pyrene	mg/kg	0.11	0.0050	0.11	ND	0.0050	0.099	0.0050	4086510
Naphthalene	mg/kg	ND	0.0050	ND	ND	0.0050	ND	0.0050	4086510
Perylene	mg/kg	0.15	0.0050	0.15	ND	0.0050	0.072	0.0050	4086510
Phenanthrene	mg/kg	0.16	0.0050	0.17	ND	0.0050	0.075	0.0050	4086510
Pyrene	mg/kg	0.50	0.0050	0.50	0.0070	0.0050	0.29	0.0050	4086510
<b>Phenolics</b>									
Pentachlorophenol	ug/g	ND	2	N/A	ND	0.5	ND	1	4095238
<b>Surrogate Recovery (%)</b>									
2,4,6-Tribromophenol	%	96	N/A	N/A	101	N/A	92	N/A	4095238
2-Fluorophenol	%	101	N/A	N/A	101	N/A	102	N/A	4095238
D5-Phenol	%	72	N/A	N/A	73	N/A	74	N/A	4095238
Leachable D10-Anthracene	%	55	N/A	52	N/A	N/A	69	N/A	4103485
Leachable D14-Terphenyl	%	61 (1)	N/A	59 (1)	N/A	N/A	75	N/A	4103485
Leachable D8-Acenaphthylene	%	54	N/A	48 (2)	N/A	N/A	66	N/A	4103485
D10-Anthracene	%	86	N/A	89	85	N/A	91	N/A	4086510
D14-Terphenyl	%	102	N/A	99	100	N/A	107	N/A	4086510
D8-Acenaphthylene	%	78	N/A	82	86	N/A	82	N/A	4086510
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate ND = Not detected N/A = Not Applicable (1) Elevated PAH RDL(s) due to limited sample. (2) PAH surrogate(s) not within acceptance limits. Insufficient sample to repeat.									

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		ANB685		ANB686		ANB687		ANB688	ANB688		
Sampling Date		2015/06/23		2015/06/23		2015/06/23		2015/06/23	2015/06/23		
	Units	CC-2	RDL	CC-9	RDL	CC-10	RDL	CC-11	CC-11 Lab-Dup	RDL	QC Batch
<b>Polyaromatic Hydrocarbons</b>											
Leachable 1-Methylnaphthalene	ug/L	0.011	0.010	N/A	0.010	N/A	0.010	ND	N/A	0.020	4103485
Leachable 2-Methylnaphthalene	ug/L	0.018	0.010	N/A	0.010	N/A	0.010	ND	N/A	0.020	4103485
Leachable Acenaphthene	ug/L	0.096	0.0050	N/A	0.0050	N/A	0.0050	0.11	N/A	0.0060	4103485
Leachable Acenaphthylene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Anthracene	ug/L	0.030	0.0050	N/A	0.0050	N/A	0.0050	0.052	N/A	0.0060	4103485
Leachable Benzo(a)anthracene	ug/L	0.0056	0.0050	N/A	0.0050	N/A	0.0050	0.012	N/A	0.0060	4103485
Leachable Benzo(a)pyrene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Benzo(b)fluoranthene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Benzo(g,h,i)perylene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Benzo(j)fluoranthene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Benzo(k)fluoranthene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Chrysene	ug/L	0.0065	0.0050	N/A	0.0050	N/A	0.0050	0.0090	N/A	0.0060	4103485
Leachable Dibenz(a,h)anthracene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Fluoranthene	ug/L	0.14	0.0050	N/A	0.0050	N/A	0.0050	0.28	N/A	0.0060	4103485
Leachable Fluorene	ug/L	0.11	0.0050	N/A	0.0050	N/A	0.0050	0.098	N/A	0.0060	4103485
Leachable Indeno(1,2,3-cd)pyrene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Naphthalene	ug/L	0.021	0.020	N/A	0.020	N/A	0.020	ND	N/A	0.030	4103485
Leachable Perylene	ug/L	ND	0.0050	N/A	0.0050	N/A	0.0050	ND	N/A	0.0060	4103485
Leachable Phenanthrene	ug/L	0.17	0.0050	N/A	0.0050	N/A	0.0050	0.032	N/A	0.0060	4103485
Leachable Pyrene	ug/L	0.063	0.0050	N/A	0.0050	N/A	0.0050	0.15	N/A	0.0060	4103485
1-Methylnaphthalene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	ND	N/A	0.0050	4086510
2-Methylnaphthalene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	ND	N/A	0.0050	4086510
Acenaphthene	mg/kg	0.015	0.0050	ND	0.0050	ND	0.0050	0.020	N/A	0.0050	4086510
Acenaphthylene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	ND	N/A	0.0050	4086510
Anthracene	mg/kg	0.090	0.0050	0.016	0.0050	0.040	0.0050	0.13	N/A	0.0050	4086510
Benzo(a)anthracene	mg/kg	0.32	0.0050	0.053	0.0050	0.17	0.0050	0.45	N/A	0.0050	4086510
Benzo(a)pyrene	mg/kg	0.29	0.0050	0.062	0.0050	0.20	0.0050	0.53	N/A	0.0050	4086510
Benzo(b)fluoranthene	mg/kg	0.41	0.0050	0.066	0.0050	0.20	0.0050	0.53	N/A	0.0050	4086510
Benzo(g,h,i)perylene	mg/kg	0.14	0.0050	0.035	0.0050	0.082	0.0050	0.24	N/A	0.0050	4086510
Benzo(j)fluoranthene	mg/kg	0.20	0.0050	0.040	0.0050	0.11	0.0050	0.29	N/A	0.0050	4086510
Benzo(k)fluoranthene	mg/kg	0.19	0.0050	0.039	0.0050	0.11	0.0050	0.29	N/A	0.0050	4086510
Chrysene	mg/kg	0.83	0.0050	0.092	0.0050	0.20	0.0050	0.58	N/A	0.0050	4086510
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable ND = Not detected											

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		ANB685		ANB686		ANB687		ANB688	ANB688		
Sampling Date		2015/06/23		2015/06/23		2015/06/23		2015/06/23	2015/06/23		
	Units	CC-2	RDL	CC-9	RDL	CC-10	RDL	CC-11	CC-11 Lab-Dup	RDL	QC Batch
Dibenz(a,h)anthracene	mg/kg	0.043	0.0050	0.0098	0.0050	0.024	0.0050	0.074	N/A	0.0050	4086510
Fluoranthene	mg/kg	0.81	0.0050	0.11	0.0050	0.41	0.0050	1.1	N/A	0.0050	4086510
Fluorene	mg/kg	0.036	0.0050	0.0084	0.0050	0.0076	0.0050	0.037	N/A	0.0050	4086510
Indeno(1,2,3-cd)pyrene	mg/kg	0.13	0.0050	0.029	0.0050	0.072	0.0050	0.21	N/A	0.0050	4086510
Naphthalene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	ND	N/A	0.0050	4086510
Perylene	mg/kg	0.13	0.0050	0.030	0.0050	0.058	0.0050	0.16	N/A	0.0050	4086510
Phenanthrene	mg/kg	0.16	0.0050	0.021	0.0050	0.033	0.0050	0.070	N/A	0.0050	4086510
Pyrene	mg/kg	0.50	0.0050	0.077	0.0050	0.30	0.0050	0.81	N/A	0.0050	4086510
<b>Phenolics</b>											
Pentachlorophenol	ug/g	ND	2	ND	1	ND	0.5	ND	ND	1	4095238
<b>Surrogate Recovery (%)</b>											
2,4,6-Tribromophenol	%	102	N/A	98	N/A	99	N/A	100	108	N/A	4095238
2-Fluorophenol	%	99	N/A	95	N/A	97	N/A	102	103	N/A	4095238
D5-Phenol	%	71	N/A	68	N/A	71	N/A	71	73	N/A	4095238
Leachable D10-Anthracene	%	68	N/A	N/A	N/A	N/A	N/A	83	N/A	N/A	4103485
Leachable D14-Terphenyl	%	72	N/A	N/A	N/A	N/A	N/A	91 (1)	N/A	N/A	4103485
Leachable D8-Acenaphthylene	%	65	N/A	N/A	N/A	N/A	N/A	85	N/A	N/A	4103485
D10-Anthracene	%	88	N/A	92	N/A	85	N/A	88	N/A	N/A	4086510
D14-Terphenyl	%	102	N/A	107	N/A	104	N/A	106	N/A	N/A	4086510
D8-Acenaphthylene	%	81	N/A	85	N/A	76	N/A	77	N/A	N/A	4086510
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable ND = Not detected (1) Elevated PAH RDL(s) due to limited sample.											

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		ANB689		ANB690		ANB691		
Sampling Date		2015/06/23		2015/06/24		2015/06/24		
	Units	CC-12	RDL	CC-13	RDL	CC-14	RDL	QC Batch
<b>Polyaromatic Hydrocarbons</b>								
Leachable 1-Methylnaphthalene	ug/L	ND	0.020	N/A	0.020	N/A	0.020	4103485
Leachable 2-Methylnaphthalene	ug/L	ND	0.020	N/A	0.020	N/A	0.020	4103485
Leachable Acenaphthene	ug/L	0.010	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Acenaphthylene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Anthracene	ug/L	0.031	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Benzo(a)anthracene	ug/L	0.012	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Benzo(a)pyrene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Benzo(b)fluoranthene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Benzo(g,h,i)perylene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Benzo(j)fluoranthene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Benzo(k)fluoranthene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Chrysene	ug/L	0.0082	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Dibenz(a,h)anthracene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Fluoranthene	ug/L	0.21	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Fluorene	ug/L	0.039	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Indeno(1,2,3-cd)pyrene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Naphthalene	ug/L	ND	0.030	N/A	0.030	N/A	0.030	4103485
Leachable Perylene	ug/L	ND	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Phenanthrene	ug/L	0.041	0.0060	N/A	0.0060	N/A	0.0060	4103485
Leachable Pyrene	ug/L	0.11	0.0060	N/A	0.0060	N/A	0.0060	4103485
1-Methylnaphthalene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	4086510
2-Methylnaphthalene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	4086510
Acenaphthene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	4086510
Acenaphthylene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	4086510
Anthracene	mg/kg	0.13	0.0050	ND	0.0050	ND	0.0050	4086510
Benzo(a)anthracene	mg/kg	0.42	0.0050	ND	0.0050	0.022	0.0050	4086510
Benzo(a)pyrene	mg/kg	0.50	0.0050	ND	0.0050	0.017	0.0050	4086510
Benzo(b)fluoranthene	mg/kg	0.51	0.0050	ND	0.0050	0.024	0.0050	4086510
Benzo(g,h,i)perylene	mg/kg	0.24	0.0050	ND	0.0050	0.0085	0.0050	4086510
Benzo(j)fluoranthene	mg/kg	0.28	0.0050	ND	0.0050	0.013	0.0050	4086510
Benzo(k)fluoranthene	mg/kg	0.28	0.0050	ND	0.0050	0.012	0.0050	4086510
Chrysene	mg/kg	0.58	0.0050	ND	0.0050	0.028	0.0050	4086510
Dibenz(a,h)anthracene	mg/kg	0.073	0.0050	ND	0.0050	ND	0.0050	4086510
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected N/A = Not Applicable								

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		ANB689		ANB690		ANB691		
Sampling Date		2015/06/23		2015/06/24		2015/06/24		
	Units	CC-12	RDL	CC-13	RDL	CC-14	RDL	QC Batch
Fluoranthene	mg/kg	1.1	0.0050	ND	0.0050	0.044	0.0050	4086510
Fluorene	mg/kg	0.027	0.0050	ND	0.0050	ND	0.0050	4086510
Indeno(1,2,3-cd)pyrene	mg/kg	0.20	0.0050	ND	0.0050	0.0078	0.0050	4086510
Naphthalene	mg/kg	ND	0.0050	ND	0.0050	ND	0.0050	4086510
Perylene	mg/kg	0.16	0.0050	ND	0.0050	ND	0.0050	4086510
Phenanthrene	mg/kg	0.060	0.0050	ND	0.0050	0.011	0.0050	4086510
Pyrene	mg/kg	0.81	0.0050	ND	0.0050	0.029	0.0050	4086510
<b>Phenolics</b>								
Pentachlorophenol	ug/g	ND	2	ND	0.05	ND	0.5	4095238
<b>Surrogate Recovery (%)</b>								
2,4,6-Tribromophenol	%	101	N/A	102	N/A	100	N/A	4095238
2-Fluorophenol	%	97	N/A	106	N/A	96	N/A	4095238
D5-Phenol	%	70	N/A	75	N/A	70	N/A	4095238
Leachable D10-Anthracene	%	73	N/A	N/A	N/A	N/A	N/A	4103485
Leachable D14-Terphenyl	%	89 (1)	N/A	N/A	N/A	N/A	N/A	4103485
Leachable D8-Acenaphthylene	%	70	N/A	N/A	N/A	N/A	N/A	4103485
D10-Anthracene	%	93	N/A	83	N/A	84	N/A	4086510
D14-Terphenyl	%	105	N/A	94	N/A	106	N/A	4086510
D8-Acenaphthylene	%	86	N/A	84	N/A	79	N/A	4086510
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected N/A = Not Applicable (1) Elevated PAH RDL(s) due to limited sample.								

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ORGANOCHLORINATED PESTICIDES BY GC-ECD (SOIL)**

Maxxam ID		ANB682		ANB683		ANB684		ANB685		
Sampling Date		2015/06/23		2015/06/23		2015/06/23		2015/06/23		
	Units	COMPOSITE A	RDL	COMPOSITE B	RDL	CC-1	RDL	CC-2	RDL	QC Batch
<b>Calculated Parameters</b>										
Aldrin + Dieldrin	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
Chlordane (Total)	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
DDT+ Metabolites	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
Heptachlor + Heptachlor epoxide	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
o,p-DDD + p,p-DDD	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
o,p-DDE + p,p-DDE	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
o,p-DDT + p,p-DDT	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
Total Endosulfan	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4080658
Total PCB	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4080658
<b>Pesticides &amp; Herbicides</b>										
Aldrin	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
a-Chlordane	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
g-Chlordane	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
o,p-DDD	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
p,p-DDD	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
o,p-DDE	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
p,p-DDE	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
o,p-DDT	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
p,p-DDT	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Dieldrin	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Lindane	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Endosulfan I (alpha)	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Endosulfan II	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Endrin	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Heptachlor	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Heptachlor epoxide	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Hexachlorobenzene	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Methoxychlor	ug/g	ND	0.063	ND	0.0050	ND	0.050	ND	0.063	4094227
Aroclor 1016	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
Aroclor 1221	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
Aroclor 1232	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
Aroclor 1242	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
Aroclor 1248	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
Aroclor 1254	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected										

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ORGANOCHLORINATED PESTICIDES BY GC-ECD (SOIL)**

Maxxam ID		ANB682		ANB683		ANB684		ANB685		
Sampling Date		2015/06/23		2015/06/23		2015/06/23		2015/06/23		
	Units	COMPOSITE A	RDL	COMPOSITE B	RDL	CC-1	RDL	CC-2	RDL	QC Batch
Aroclor 1260	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
Aroclor 1262	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
Aroclor 1268	ug/g	ND	0.20	ND	0.015	ND	0.15	ND	0.20	4094227
alpha-BHC	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
beta-BHC	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
delta-BHC	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Endosulfan sulfate	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Endrin aldehyde	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Endrin ketone	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Mirex	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Octachlorostyrene	ug/g	ND	0.025	ND	0.0020	ND	0.020	ND	0.025	4094227
Toxaphene	ug/g	ND	1.0	ND	0.080	ND	0.80	ND	1.0	4094227
<b>Surrogate Recovery (%)</b>										
2,4,5,6-Tetrachloro-m-xylene	%	99	N/A	85	N/A	97	N/A	85	N/A	4094227
Decachlorobiphenyl	%	104	N/A	92	N/A	107	N/A	101	N/A	4094227
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected N/A = Not Applicable										

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ORGANOCHLORINATED PESTICIDES BY GC-ECD (SOIL)**

Maxxam ID		ANB686		ANB687		ANB688		ANB688		ANB689		
Sampling Date		2015/06/23		2015/06/23		2015/06/23		2015/06/23		2015/06/23		
	Units	CC-9	RDL	CC-10	RDL	CC-11	CC-11 Lab-Dup	RDL	CC-12	RDL	QC Batch	

Calculated Parameters											
Aldrin + Dieldrin	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
Chlordane (Total)	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
DDT+ Metabolites	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
Heptachlor + Heptachlor epoxide	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
o,p-DDD + p,p-DDD	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
o,p-DDE + p,p-DDE	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
o,p-DDT + p,p-DDT	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
Total Endosulfan	ug/g	ND	0.0030	ND	0.015	ND	N/A	0.025	ND	0.030	4080658
Total PCB	ug/g	ND	0.023	ND	0.11	ND	N/A	0.20	ND	0.23	4080658

Pesticides & Herbicides											
Aldrin	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
a-Chlordane	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
g-Chlordane	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
o,p-DDD	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
p,p-DDD	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
o,p-DDE	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
p,p-DDE	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
o,p-DDT	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
p,p-DDT	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Dieldrin	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Lindane	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Endosulfan I (alpha)	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Endosulfan II	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Endrin	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Heptachlor	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Heptachlor epoxide	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Hexachlorobenzene	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Methoxychlor	ug/g	ND	0.0075	ND	0.038	ND	ND	0.063	ND	0.075	4094227
Aroclor 1016	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
Aroclor 1221	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
Aroclor 1232	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
Aroclor 1242	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
Aroclor 1248	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
Lab-Dup = Laboratory Initiated Duplicate  
ND = Not detected  
N/A = Not Applicable

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ORGANOCHLORINATED PESTICIDES BY GC-ECD (SOIL)**

Maxxam ID		ANB686		ANB687		ANB688	ANB688		ANB689		
Sampling Date		2015/06/23		2015/06/23		2015/06/23	2015/06/23		2015/06/23		
	Units	CC-9	RDL	CC-10	RDL	CC-11	CC-11 Lab-Dup	RDL	CC-12	RDL	QC Batch
Aroclor 1254	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
Aroclor 1260	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
Aroclor 1262	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
Aroclor 1268	ug/g	ND	0.023	ND	0.11	ND	ND	0.20	ND	0.23	4094227
alpha-BHC	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
beta-BHC	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
delta-BHC	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Endosulfan sulfate	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Endrin aldehyde	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Endrin ketone	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Mirex	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Octachlorostyrene	ug/g	ND	0.0030	ND	0.015	ND	ND	0.025	ND	0.030	4094227
Toxaphene	ug/g	ND	0.12	ND	0.60	ND	ND	1.0	ND	1.2	4094227
<b>Surrogate Recovery (%)</b>											
2,4,5,6-Tetrachloro-m-xylene	%	87	N/A	103	N/A	103	95	N/A	104	N/A	4094227
Decachlorobiphenyl	%	89	N/A	89	N/A	93	106	N/A	111	N/A	4094227
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate ND = Not detected N/A = Not Applicable											

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

**ORGANOCHLORINATED PESTICIDES BY GC-ECD (SOIL)**

Maxxam ID		ANB690		ANB691		
Sampling Date		2015/06/24		2015/06/24		
	Units	CC-13	RDL	CC-14	RDL	QC Batch
<b>Calculated Parameters</b>						
Aldrin + Dieldrin	ug/g	ND	0.0020	ND	0.0030	4080658
Chlordane (Total)	ug/g	ND	0.0020	ND	0.0030	4080658
DDT+ Metabolites	ug/g	ND	0.0020	ND	0.0030	4080658
Heptachlor + Heptachlor epoxide	ug/g	ND	0.0020	ND	0.0030	4080658
o,p-DDD + p,p-DDD	ug/g	ND	0.0020	ND	0.0030	4080658
o,p-DDE + p,p-DDE	ug/g	ND	0.0020	ND	0.0030	4080658
o,p-DDT + p,p-DDT	ug/g	ND	0.0020	ND	0.0030	4080658
Total Endosulfan	ug/g	ND	0.0020	ND	0.0030	4080658
Total PCB	ug/g	ND	0.015	ND	0.023	4080658
<b>Pesticides &amp; Herbicides</b>						
Aldrin	ug/g	ND	0.0020	ND	0.0030	4094227
a-Chlordane	ug/g	ND	0.0020	ND	0.0030	4094227
g-Chlordane	ug/g	ND	0.0020	ND	0.0030	4094227
o,p-DDD	ug/g	ND	0.0020	ND	0.0030	4094227
p,p-DDD	ug/g	ND	0.0020	ND	0.0030	4094227
o,p-DDE	ug/g	ND	0.0020	ND	0.0030	4094227
p,p-DDE	ug/g	ND	0.0020	ND	0.0030	4094227
o,p-DDT	ug/g	ND	0.0020	ND	0.0030	4094227
p,p-DDT	ug/g	ND	0.0020	ND	0.0030	4094227
Dieldrin	ug/g	ND	0.0020	ND	0.0030	4094227
Lindane	ug/g	ND	0.0020	ND	0.0030	4094227
Endosulfan I (alpha)	ug/g	ND	0.0020	ND	0.0030	4094227
Endosulfan II	ug/g	ND	0.0020	ND	0.0030	4094227
Endrin	ug/g	ND	0.0020	ND	0.0030	4094227
Heptachlor	ug/g	ND	0.0020	ND	0.0030	4094227
Heptachlor epoxide	ug/g	ND	0.0020	ND	0.0030	4094227
Hexachlorobenzene	ug/g	ND	0.0020	ND	0.0030	4094227
Methoxychlor	ug/g	ND	0.0050	ND	0.0075	4094227
Aroclor 1016	ug/g	ND	0.015	ND	0.023	4094227
Aroclor 1221	ug/g	ND	0.015	ND	0.023	4094227
Aroclor 1232	ug/g	ND	0.015	ND	0.023	4094227
Aroclor 1242	ug/g	ND	0.015	ND	0.023	4094227
Aroclor 1248	ug/g	ND	0.015	ND	0.023	4094227
Aroclor 1254	ug/g	ND	0.015	ND	0.023	4094227
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected						

Maxxam Job #: B5C3479  
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Sampler Initials: JK

**ORGANOCHLORINATED PESTICIDES BY GC-ECD (SOIL)**

Maxxam ID		ANB690		ANB691		
Sampling Date		2015/06/24		2015/06/24		
	Units	CC-13	RDL	CC-14	RDL	QC Batch
Aroclor 1260	ug/g	ND	0.015	ND	0.023	4094227
Aroclor 1262	ug/g	ND	0.015	ND	0.023	4094227
Aroclor 1268	ug/g	ND	0.015	ND	0.023	4094227
alpha-BHC	ug/g	ND	0.0020	ND	0.0030	4094227
beta-BHC	ug/g	ND	0.0020	ND	0.0030	4094227
delta-BHC	ug/g	ND	0.0020	ND	0.0030	4094227
Endosulfan sulfate	ug/g	ND	0.0020	ND	0.0030	4094227
Endrin aldehyde	ug/g	ND	0.0020	ND	0.0030	4094227
Endrin ketone	ug/g	ND	0.0020	ND	0.0030	4094227
Mirex	ug/g	ND	0.0020	ND	0.0030	4094227
Octachlorostyrene	ug/g	ND	0.0020	ND	0.0030	4094227
Toxaphene	ug/g	ND	0.080	ND	0.12	4094227
<b>Surrogate Recovery (%)</b>						
2,4,5,6-Tetrachloro-m-xylene	%	89	N/A	85	N/A	4094227
Decachlorobiphenyl	%	88	N/A	86	N/A	4094227
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected N/A = Not Applicable						

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### GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.0°C
Package 2	0.3°C
Package 3	3.7°C

TEH Analysis: No creosote present.

OC Pesticide Analysis: Detection limits for some samples were adjusted for high moisture content. Due to the sample matrix, some samples required dilution. Detection limits were adjusted accordingly.

CPH Analysis: Due to the sample matrix, most of the samples required dilution. Detection limits were adjusted accordingly. Also, Detection limits for some samples were adjusted for high moisture content.

**Results relate only to the items tested.**

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**QUALITY ASSURANCE REPORT**

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4086483	Isobutylbenzene - Extractable	2015/07/01	99	30 - 130	100	30 - 130	100	%						
4086483	n-Dotriacontane - Extractable	2015/07/01	89	30 - 130	93	30 - 130	100	%						
4086510	D10-Anthracene	2015/07/01	93	30 - 130	83	30 - 130	87	%						
4086510	D14-Terphenyl	2015/07/01	100	30 - 130	86	30 - 130	91	%						
4086510	D8-Acenaphthylene	2015/07/01	87	30 - 130	88	30 - 130	86	%						
4086922	Isobutylbenzene - Volatile	2015/06/30	106	60 - 130	100	60 - 130	113	%						
4088447	Isobutylbenzene - Volatile	2015/07/02	104	60 - 130	91	60 - 130	101	%						
4094227	2,4,5,6-Tetrachloro-m-xylene	2015/07/09	71	50 - 130	82	50 - 130	85	%						
4094227	Decachlorobiphenyl	2015/07/09	74	50 - 130	90	50 - 130	97	%						
4095238	2,4,6-Tribromophenol	2015/07/08	104	50 - 130	99	50 - 130	103	%						
4095238	2-Fluorophenol	2015/07/08	103	50 - 130	26 (4)	50 - 130	26 (4)							
4095238	D5-Phenol	2015/07/08	75	30 - 130	72	30 - 130	73	%						
4103485	Leachable D10-Anthracene	2015/07/17			101	30 - 130	97	%			93	%		
4103485	Leachable D14-Terphenyl	2015/07/17			102	30 - 130	100	%			99	%		
4103485	Leachable D8-Acenaphthylene	2015/07/17			101	30 - 130	96	%			95	%		
4086483	>C10-C16 Hydrocarbons	2015/07/01	74	30 - 130	79	30 - 130	ND, RDL=10	mg/kg	NC	50				
4086483	>C16-C21 Hydrocarbons	2015/07/01	88	30 - 130	91	30 - 130	ND, RDL=10	mg/kg	NC	50				
4086483	>C21-<C32 Hydrocarbons	2015/07/01	98	30 - 130	111	30 - 130	ND, RDL=15	mg/kg	NC	50				
4086510	1-Methylnaphthalene	2015/07/01	83	30 - 130	84	30 - 130	ND, RDL=0.0050	mg/kg	NC	50				
4086510	2-Methylnaphthalene	2015/07/01	84	30 - 130	84	30 - 130	ND, RDL=0.0050	mg/kg	NC	50				
4086510	Acenaphthene	2015/07/01	80	30 - 130	89	30 - 130	ND, RDL=0.0050	mg/kg	11	50				
4086510	Acenaphthylene	2015/07/01	73	30 - 130	86	30 - 130	ND, RDL=0.0050	mg/kg	NC	50				
4086510	Anthracene	2015/07/01	NC	30 - 130	83	30 - 130	ND, RDL=0.0050	mg/kg	7.6	50				
4086510	Benzo(a)anthracene	2015/07/01	NC	30 - 130	78	30 - 130	ND, RDL=0.0050	mg/kg	15	50				

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4086510	Benzo(a)pyrene	2015/07/01	NC	30 - 130	81	30 - 130	ND, RDL=0.0050	mg/kg	14	50				
4086510	Benzo(b)fluoranthene	2015/07/01	NC	30 - 130	96	30 - 130	ND, RDL=0.0050	mg/kg	12	50				
4086510	Benzo(g,h,i)perylene	2015/07/01	NC	30 - 130	70	30 - 130	ND, RDL=0.0050	mg/kg	4.6	50				
4086510	Benzo(j)fluoranthene	2015/07/01	NC	30 - 130	86	30 - 130	ND, RDL=0.0050	mg/kg	2.6	50				
4086510	Benzo(k)fluoranthene	2015/07/01	NC	30 - 130	84	30 - 130	ND, RDL=0.0050	mg/kg	3.3	50				
4086510	Chrysene	2015/07/01	NC	30 - 130	89	30 - 130	ND, RDL=0.0050	mg/kg	17	50				
4086510	Dibenz(a,h)anthracene	2015/07/01	94	30 - 130	62	30 - 130	ND, RDL=0.0050	mg/kg	11	50				
4086510	Fluoranthene	2015/07/01	NC	30 - 130	83	30 - 130	ND, RDL=0.0050	mg/kg	1.5	50				
4086510	Fluorene	2015/07/01	96	30 - 130	92	30 - 130	ND, RDL=0.0050	mg/kg	11	50				
4086510	Indeno(1,2,3-cd)pyrene	2015/07/01	NC	30 - 130	63	30 - 130	ND, RDL=0.0050	mg/kg	2.4	50				
4086510	Naphthalene	2015/07/01	80	30 - 130	85	30 - 130	ND, RDL=0.0050	mg/kg	NC	50				
4086510	Perylene	2015/07/01	NC	30 - 130	81	30 - 130	ND, RDL=0.0050	mg/kg	5.4	50				
4086510	Phenanthrene	2015/07/01	NC	30 - 130	84	30 - 130	ND, RDL=0.0050	mg/kg	7.9	50				
4086510	Pyrene	2015/07/01	NC	30 - 130	83	30 - 130	ND, RDL=0.0050	mg/kg	0.054	50				
4086856	Clay	2015/07/10							3.8	35				
4086856	Gravel	2015/07/10							NC (1)	35				
4086856	Sand	2015/07/10							6.5	35				
4086856	Silt	2015/07/10							6.0	35				

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4086922	Benzene	2015/06/30	61	60 - 130	78	60 - 140	ND, RDL=0.0050	mg/kg	NC	50				
4086922	C6 - C10 (less BTEX)	2015/06/30					ND, RDL=2.5	mg/kg	NC	50				
4086922	Ethylbenzene	2015/06/30	63	60 - 130	80	60 - 140	ND, RDL=0.010	mg/kg	NC	50				
4086922	Methyl t-butyl ether (MTBE)	2015/06/30			76	60 - 140	ND, RDL=0.025	mg/kg	NC	50				
4086922	Toluene	2015/06/30	74	60 - 130	75	60 - 140	ND, RDL=0.025	mg/kg	NC	50				
4086922	Total Xylenes	2015/06/30	77	60 - 130	86	60 - 140	ND, RDL=0.050	mg/kg	NC	50				
4087046	Soluble (Hot Water) Boron (B)	2015/07/04	NC	75 - 125	102	75 - 125	ND, RDL=0.30	mg/kg	5.9	35				
4088447	Benzene	2015/07/02	70	60 - 130	75	60 - 140	ND, RDL=0.0050	mg/kg	NC	50				
4088447	C6 - C10 (less BTEX)	2015/07/02					ND, RDL=2.5	mg/kg	NC	50				
4088447	Ethylbenzene	2015/07/02	71	60 - 130	83	60 - 140	ND, RDL=0.010	mg/kg	NC	50				
4088447	Methyl t-butyl ether (MTBE)	2015/07/02			73	60 - 140	ND, RDL=0.025	mg/kg	NC	50				
4088447	Toluene	2015/07/02	85	60 - 130	81	60 - 140	ND, RDL=0.025	mg/kg	NC	50				
4088447	Total Xylenes	2015/07/02	83	60 - 130	83	60 - 140	ND, RDL=0.050	mg/kg	NC	50				
4088592	Organic Carbon (TOC)	2015/07/02					ND, RDL=0.20	g/kg					97	75 - 125
4088619	Acid Extractable Aluminum (Al)	2015/07/02					ND, RDL=10	mg/kg	1.1	35				
4088619	Acid Extractable Antimony (Sb)	2015/07/02	98	75 - 125	103	75 - 125	ND, RDL=2.0	mg/kg	NC	35				
4088619	Acid Extractable Arsenic (As)	2015/07/02	97	75 - 125	98	75 - 125	ND, RDL=2.0	mg/kg	NC	35				
4088619	Acid Extractable Barium (Ba)	2015/07/02	NC	75 - 125	98	75 - 125	ND, RDL=5.0	mg/kg	5.5	35				
4088619	Acid Extractable Beryllium (Be)	2015/07/02	101	75 - 125	98	75 - 125	ND, RDL=2.0	mg/kg	NC	35				
4088619	Acid Extractable Bismuth (Bi)	2015/07/02	104	75 - 125	99	75 - 125	ND, RDL=2.0	mg/kg	NC	35				
4088619	Acid Extractable Boron (B)	2015/07/02	95	75 - 125	93	75 - 125	ND, RDL=50	mg/kg	NC	35				

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4088619	Acid Extractable Cadmium (Cd)	2015/07/02	99	75 - 125	97	75 - 125	ND, RDL=0.30	mg/kg	NC	35				
4088619	Acid Extractable Chromium (Cr)	2015/07/02	98	75 - 125	96	75 - 125	ND, RDL=2.0	mg/kg	0.45	35				
4088619	Acid Extractable Cobalt (Co)	2015/07/02	99	75 - 125	98	75 - 125	ND, RDL=1.0	mg/kg	2.9	35				
4088619	Acid Extractable Copper (Cu)	2015/07/02	98	75 - 125	97	75 - 125	ND, RDL=2.0	mg/kg	0.82	35				
4088619	Acid Extractable Iron (Fe)	2015/07/02					ND, RDL=50	mg/kg	3.5	35				
4088619	Acid Extractable Lead (Pb)	2015/07/02	NC	75 - 125	96	75 - 125	ND, RDL=0.50	mg/kg	4.4	35				
4088619	Acid Extractable Lithium (Li)	2015/07/02	NC	75 - 125	104	75 - 125	ND, RDL=2.0	mg/kg	2.9	35				
4088619	Acid Extractable Manganese (Mn)	2015/07/02	NC	75 - 125	98	75 - 125	ND, RDL=2.0	mg/kg	4.9	35				
4088619	Acid Extractable Mercury (Hg)	2015/07/02	98	75 - 125	99	75 - 125	ND, RDL=0.10	mg/kg	NC	35				
4088619	Acid Extractable Molybdenum (Mo)	2015/07/02	101	75 - 125	100	75 - 125	ND, RDL=2.0	mg/kg	NC	35				
4088619	Acid Extractable Nickel (Ni)	2015/07/02	97	75 - 125	95	75 - 125	ND, RDL=2.0	mg/kg	1.1	35				
4088619	Acid Extractable Rubidium (Rb)	2015/07/02	97	75 - 125	97	75 - 125	ND, RDL=2.0	mg/kg	NC	35				
4088619	Acid Extractable Selenium (Se)	2015/07/02	98	75 - 125	99	75 - 125	ND, RDL=1.0	mg/kg	NC	35				
4088619	Acid Extractable Silver (Ag)	2015/07/02	102	75 - 125	98	75 - 125	ND, RDL=0.50	mg/kg	NC	35				
4088619	Acid Extractable Strontium (Sr)	2015/07/02	98	75 - 125	95	75 - 125	ND, RDL=5.0	mg/kg	NC	35				
4088619	Acid Extractable Thallium (Tl)	2015/07/02	103	75 - 125	101	75 - 125	ND, RDL=0.10	mg/kg	NC	35				
4088619	Acid Extractable Tin (Sn)	2015/07/02	107	75 - 125	97	75 - 125	ND, RDL=2.0	mg/kg	NC	35				
4088619	Acid Extractable Uranium (U)	2015/07/02	102	75 - 125	97	75 - 125	ND, RDL=0.10	mg/kg	NC	35				
4088619	Acid Extractable Vanadium (V)	2015/07/02	98	75 - 125	96	75 - 125	ND, RDL=2.0	mg/kg	1.4	35				
4088619	Acid Extractable Zinc (Zn)	2015/07/02	NC	75 - 125	101	75 - 125	ND, RDL=5.0	mg/kg	3.3	35				
4089291	Total Carbon-combustion IR	2015/07/03					ND, RDL=0.20	g/kg	4.7	35			101	75 - 125
4089318	Total Carbon-combustion IR	2015/07/03					ND, RDL=0.20	g/kg	0.81	35			100	75 - 125
4090416	Organic Carbon (TOC)	2015/07/03					ND, RDL=0.20	g/kg	1.2	35			97	75 - 125

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4092138	Chromium (VI)	2015/07/05	62 (2)	75 - 125	100	80 - 120	ND, RDL=0.2	ug/g	NC	35			92	80 - 120
4094227	a-Chlordane	2015/07/09	70	50 - 130	85	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Aldrin	2015/07/09	70	50 - 130	77	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	alpha-BHC	2015/07/09	73	30 - 130	78	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	Aroclor 1016	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1221	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1232	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1242	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1248	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1254	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1260	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1262	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	Aroclor 1268	2015/07/09					ND, RDL=0.015	ug/g	NC	40				
4094227	beta-BHC	2015/07/09	69	30 - 130	78	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	delta-BHC	2015/07/09	83	30 - 130	72	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	Dieldrin	2015/07/09	77	50 - 130	88	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Endosulfan I (alpha)	2015/07/09	72	50 - 130	61	50 - 130	ND, RDL=0.0020	ug/g	NC	40				

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4094227	Endosulfan II	2015/07/09	84	50 - 130	77	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Endosulfan sulfate	2015/07/09	63	30 - 130	85	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	Endrin aldehyde	2015/07/09	61	30 - 130	101	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	Endrin ketone	2015/07/09	68	30 - 130	79	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	Endrin	2015/07/09	70	50 - 130	81	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	g-Chlordane	2015/07/09	69	50 - 130	83	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Heptachlor epoxide	2015/07/09	74	50 - 130	84	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Heptachlor	2015/07/09	35 (3)	50 - 130	76	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Hexachlorobenzene	2015/07/09	77	50 - 130	86	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Lindane	2015/07/09	77	50 - 130	82	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Methoxychlor	2015/07/09	62	50 - 130	88	50 - 130	ND, RDL=0.0050	ug/g	NC	40				
4094227	Mirex	2015/07/09	75	30 - 130	76	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	o,p-DDD	2015/07/09	90	50 - 130	100	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	o,p-DDE	2015/07/09	63	50 - 130	87	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	o,p-DDT	2015/07/09	60	50 - 130	83	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Octachlorostyrene	2015/07/09	77	30 - 130	89	30 - 130	ND, RDL=0.0020	ug/g	NC	50				
4094227	p,p-DDD	2015/07/09	80	50 - 130	92	50 - 130	ND, RDL=0.0020	ug/g	NC	40				

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4094227	p,p-DDE	2015/07/09	91	50 - 130	75	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	p,p-DDT	2015/07/09	58	50 - 130	85	50 - 130	ND, RDL=0.0020	ug/g	NC	40				
4094227	Toxaphene	2015/07/09					ND, RDL=0.080	ug/g	NC	50				
4095238	Pentachlorophenol	2015/07/08	90	50 - 130	97	50 - 130	ND, RDL=0.05	ug/g	NC	50				
4095855	Sample Weight (as received)	2015/07/08					NA	g	0.081	N/A				
4095856	Final pH	2015/07/08					4.39	N/A	0.60	N/A				
4096214	Leachable Aluminum (Al)	2015/07/09	105	80 - 120	97	80 - 120	ND, RDL=10	ug/L						
4096214	Leachable Antimony (Sb)	2015/07/09	113	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Arsenic (As)	2015/07/09	99	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Barium (Ba)	2015/07/09	100	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L						
4096214	Leachable Beryllium (Be)	2015/07/09	107	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Cadmium (Cd)	2015/07/09	104	80 - 120	104	80 - 120	ND, RDL=0.30	ug/L						
4096214	Leachable Calcium (Ca)	2015/07/09	NC	80 - 120	96	80 - 120	420, RDL=100 (5)	ug/L						
4096214	Leachable Chromium (Cr)	2015/07/09	94	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Cobalt (Co)	2015/07/09	95	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L						
4096214	Leachable Copper (Cu)	2015/07/09	91	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Iron (Fe)	2015/07/09	99	80 - 120	99	80 - 120	ND, RDL=50	ug/L						
4096214	Leachable Lead (Pb)	2015/07/09	98	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L						
4096214	Leachable Lithium (Li)	2015/07/09	109	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Magnesium (Mg)	2015/07/09	NC	80 - 120	96	80 - 120	ND, RDL=100	ug/L						
4096214	Leachable Manganese (Mn)	2015/07/09	97	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Molybdenum (Mo)	2015/07/09	NC	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Nickel (Ni)	2015/07/09	93	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L						

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

**QUALITY ASSURANCE REPORT(CONT'D)**

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4096214	Leachable Potassium (K)	2015/07/09	NC	80 - 120	106	80 - 120	ND, RDL=100	ug/L						
4096214	Leachable Selenium (Se)	2015/07/09	103	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L						
4096214	Leachable Silver (Ag)	2015/07/09	108	80 - 120	106	80 - 120	ND, RDL=0.50	ug/L						
4096214	Leachable Strontium (Sr)	2015/07/09	NC	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L						
4096214	Leachable Thallium (Tl)	2015/07/09	101	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L						
4096214	Leachable Tin (Sn)	2015/07/09	110	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Uranium (U)	2015/07/09	109	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L						
4096214	Leachable Vanadium (V)	2015/07/09	97	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L						
4096214	Leachable Zinc (Zn)	2015/07/09	95	80 - 120	95	80 - 120	ND, RDL=5.0	ug/L						
4103485	Leachable 1-Methylnaphthalene	2015/07/17			100	30 - 130	ND, RDL=0.010	ug/L	NC	40	ND, RDL=0.010	ug/L		
4103485	Leachable 2-Methylnaphthalene	2015/07/17			98	30 - 130	ND, RDL=0.010	ug/L	NC	40	ND, RDL=0.010	ug/L		
4103485	Leachable Acenaphthene	2015/07/17			110	30 - 130	ND, RDL=0.0050	ug/L	26	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Acenaphthylene	2015/07/17			111	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Anthracene	2015/07/17			111	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Benzo(a)anthracene	2015/07/17			105	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Benzo(a)pyrene	2015/07/17			108	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Benzo(b)fluoranthene	2015/07/17			109	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Benzo(g,h,i)perylene	2015/07/17			109	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Benzo(j)fluoranthene	2015/07/17			108	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

**QUALITY ASSURANCE REPORT(CONT'D)**

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4103485	Leachable Benzo(k)fluoranthene	2015/07/17			116	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Chrysene	2015/07/17			114	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Dibenz(a,h)anthracene	2015/07/17			103	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Fluoranthene	2015/07/17			107	30 - 130	ND, RDL=0.0050	ug/L	0.95	40	0.0060, RDL=0.0050	ug/L		
4103485	Leachable Fluorene	2015/07/17			113	30 - 130	ND, RDL=0.0050	ug/L	16	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Indeno(1,2,3-cd)pyrene	2015/07/17			108	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Naphthalene	2015/07/17			100	30 - 130	ND, RDL=0.020	ug/L	NC	40	ND, RDL=0.020	ug/L		
4103485	Leachable Perylene	2015/07/17			107	30 - 130	ND, RDL=0.0050	ug/L	NC	40	ND, RDL=0.0050	ug/L		
4103485	Leachable Phenanthrene	2015/07/17			111	30 - 130	ND, RDL=0.0050	ug/L	4.3	40	0.0058, RDL=0.0050	ug/L		

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

**QUALITY ASSURANCE REPORT(CONT'D)**

Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		Leachate Blank		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	Value	Units	% Recovery	QC Limits
4103485	Leachable Pyrene	2015/07/17			105	30 - 130	ND, RDL=0.0050	ug/L	37	40	ND, RDL=0.0050	ug/L		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Leachate Blank: A blank matrix containing all reagents used in the leaching procedure. Used to determine any process contamination.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) PSA: %RPD acceptable. Duplicate values agree within 10% absolute.

(2) The matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample. The matrix spike was reanalyzed to confirm result.

(3) The recovery for the flagged target analyte was below the control limit as stipulated by Ontario Regulation 153, however, this recovery is still within Maxxam's performance based limits. Results reported for this specific analyte with spike recoveries within this range are still valid but may have an associated low bias.

(4) Surrogate recovery was below the lower control limit. This may represent a low bias in some results.

(5) Low level lab contamination. Minimal impact on data quality.

Maxxam Job #: B5C3479  
Report Date: 2015/07/20

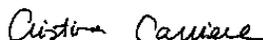
Stantec Consulting Ltd  
Client Project #: 121413541  
Site Location: CRIPPLE CREEK  
Sampler Initials: JK

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



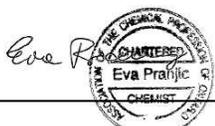
Colleen Acker, Supervisor, General Chemistry



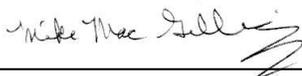
Cristina Carriere, Scientific Services



Eric Dearman, Scientific Specialist


Eva Pranjic, M.Sc., C.Chem, Scientific Specialist



Mike MacGillivray, Scientific Specialist (Inorganics)



Rose MacDonald, Scientific Specialist (Organics)

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your Project #: B5C3479  
Your C.O.C. #: n-a

**Attention:Bedford Client Svc (SubContr)**

Maxxam Analytics  
200 Bluewater road  
Bedford, NS  
CANADA B4B 1G9

**Report Date: 2015/07/07**  
Report #: R2020935  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B536432**

**Received: 2015/06/30, 08:30**

Sample Matrix: SOIL  
# Samples Received: 10

<b>Analyses</b>	<b>Quantity</b>	<b>Date Extracted</b>	<b>Date Analyzed</b>	<b>Laboratory Method</b>	<b>Primary Reference</b>
Total Cyanide*	10	2015/07/06	2015/07/07	STL SOP-00035	MA300-CN 1.2 R3 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

\* Maxxam is accredited as per the MDDELCC program.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Lauriane Bernard, Project Manager

Email: LBernard@maxxam.ca

Phone# (514)448-9001

=====  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B536432  
Report Date: 2015/07/07

Maxxam Analytics  
Client Project #: B5C3479

**CONVENTIONAL PARAMETERS (SOIL)**

Maxxam ID		BA8505		BA8506		BA8507		BA8508		
Sampling Date		2015/06/25		2015/06/25		2015/06/25		2015/06/25		
COC Number		n-a		n-a		n-a		n-a		
	<b>Units</b>	<b>ANB682-03R\ COMPOSITE A</b>	<b>RDL</b>	<b>ANB683-03R\ COMPOSITE B</b>	<b>ANB684-03R\ CC-1</b>	<b>RDL</b>	<b>ANB685-03R\ CC-2</b>	<b>RDL</b>	<b>QC Batch</b>	
% MOISTURE	%	59	N/A	21	41	N/A	64	N/A	N/A	
<b>CONVENTIONALS</b>										
Total Cyanide (CN)	mg/kg	<1	1	<0.5	<0.5	0.5	<1	1	1475539	
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable										

Maxxam ID		BA8509		BA8510		BA8511		BA8512		
Sampling Date		2015/06/25		2015/06/25		2015/06/25		2015/06/25		
COC Number		n-a		n-a		n-a		n-a		
	<b>Units</b>	<b>ANB686-03R\ CC-9</b>	<b>ANB687-03R\ CC-10</b>	<b>RDL</b>	<b>ANB688-03R\ CC-11</b>	<b>ANB689-03R\ CC-12</b>	<b>RDL</b>	<b>QC Batch</b>		
% MOISTURE	%	35	37	N/A	59	62	N/A	N/A		
<b>CONVENTIONALS</b>										
Total Cyanide (CN)	mg/kg	<0.5	<0.5	0.5	<1	<1	1	1475539		
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable										

Maxxam ID		BA8513		BA8513		BA8514				
Sampling Date		2015/06/25		2015/06/25		2015/06/25				
COC Number		n-a		n-a		n-a				
	<b>Units</b>	<b>ANB690-03R\ CC-13</b>	<b>ANB690-03R\ CC-13 Lab-Dup</b>	<b>ANB691-03R\ CC-14</b>	<b>RDL</b>	<b>QC Batch</b>				
% MOISTURE	%	20	20	31	N/A	N/A				
<b>CONVENTIONALS</b>										
Total Cyanide (CN)	mg/kg	<0.5	<0.5	<0.5	0.5	1475539				
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable										

Maxxam Job #: B536432  
Report Date: 2015/07/07

Maxxam Analytics  
Client Project #: B5C3479

### GENERAL COMMENTS

All results are calculated on a dry weight basis except where not applicable.

Condition of sample(s) upon receipt: GOOD

#### CONVENTIONAL PARAMETERS (SOIL)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

**Results relate only to the items tested.**

Maxxam Job #: B536432  
Report Date: 2015/07/07

Maxxam Analytics  
Client Project #: B5C3479

**QUALITY ASSURANCE REPORT**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
1475539	MH1	QC Standard	Total Cyanide (CN)	2015/07/07		89	%	80 - 120
1475539	MH1	Spiked Blank	Total Cyanide (CN)	2015/07/07		96	%	75 - 125
1475539	MH1	Method Blank	Total Cyanide (CN)	2015/07/07	<0.5		mg/kg	

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Job #: B536432  
Report Date: 2015/07/07

Maxxam Analytics  
Client Project #: B5C3479

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Madina Hamrouni, B.Sc., Chemist

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

MAXXAM ANALYTICS  
800 BLUEWATER ROAD  
BEDFORD, NS B4B1G9  
902-420-0203

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www.purifier.com

1 of file 8



OR PIN: 609

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<b>Invoice Information:</b>		<b>Report Information (if differs from invoice):</b>	
Client Code: 10A50	Company Name: Startec	Quote B4217ILM	TURNAROUND TIME
Maxxam Job#: BSC3479	Contact Name: Kelley Fraser	121413541	Standard X (Please send PAH results within 5 days)
Address: 102-40 Highfield Park Drive Dartmouth NS B3A 0A3	Contact Name: _____	Project/Venue/Location: Cripple Creek	10 day <input type="checkbox"/>
Email: kelly.fraser@startec.com	Address: _____	State: _____	If RUSH Specify Date: _____
Ph: (902) 469-7777 Fax: (902) 468-9009	Postal Code: _____	Site # _____	Pre-schedule rush work <input type="checkbox"/>
		Task Order# _____	Charge for # jars used but not submitted
		Sampled by: _____	

<b>Guideline Requirements/ Detection Limits/ Special Instructions</b>	
*extra bottles for each site so we can archive samples at Startec. Also extra bottles to allow for analyses that have to be subbed out as per quote *For Tin, use RDL of 1 mg/kg *Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/Non-Potable/Tissue/Soil/Sediment/Metal/Sewage	
Field Sample Identification	Matrix *
1 Composite A	sediment
2 Composite A	sediment
3 CC-1	sediment
4 CC-2	sediment
5 CC-9	sediment
6 CC-10	sediment
7 CC-11	sediment
8 CC-12	sediment
9 CC-13	TT
10 CC-14	TT
11	

Relinquished By: (Signature/Print) <i>Sarah Mason</i>	Date/Time <i>JUNE 15/15 12:56</i>	Received By: (Signature/Print) <i>SARA MASON</i>	Date/Time <i>JUNE 15/15 12:54</i>
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2015 JUN 25 12:54