

**NATIONAL CAPITAL COMMISSION  
COMMISSION DE LA CAPITALE NATIONALE**

**National Capital Commission (NCC)**

**EMERALD ASH BORER REPLACEMENT PROGRAM  
SPRING 2019**

**Remic Rapids**

**LOT #5**

**CONTRACT SPECIFICATIONS  
FOR TENDER**

**March 2019**

**Canada**

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#### **APPENDIX A**

Soils Sampling – Buckthorn Removal, Remic Rapids, Ottawa, Ontario, by DST Consulting Engineers

#### **DRAWINGS**

Planting Plan	L1
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#### **INFORMATION SHEETS**

Common Buckthorn  
Poison Ivy  
Stinging Nettle  
Tick Safety  
West Nile Virus  
Wild Parsnip  
Giant Hogweed

Basis of Payment

- .1 Payment at the price per item listed in the Tender Form shall be full compensation for all labour, services and equipment as well as the supply, delivery and installation of all materials required for the proper execution of this Contract.

**1.0 SITE PREPARATION**

1.1 Mobilization and general requirements

- .1 This item includes, but may not be limited to, steps to obtain permits, implementation of safety measures, environmental protection, temporary facilities, signage, cleaning, layout, utility locates, contractor testing, moving equipment, supply of a spill kit on-site, site reinstatement, removing equipment and fencing at job completion, and all other requirements identified in the contract documents not covered under specific items.
- .2 This item will not be measured but will be paid on a lump sum basis.

1.2 Maintenance, temporary removal, and final removal of existing silt fencing

- .1 This item does not include the supply or installation of silt fencing, as it is already installed, but it does include temporary removal and replacement for the purpose of excavating adjacent the pathway, maintenance of the silt fencing in working order for the duration of the contract and final removal at the end of the contract.
- .2 This item will not be measured but will be paid on a lump sum basis.

1.3 Transportation, installation, maintenance and removal of snow fencing and signage.

- .1 This item includes the collection, transport and installation of snow fencing, posts and signage from the designated NCC storage facility (1740 Woodroffe Avenue, Ottawa, Ontario Contact Brian Huff, tel. 613-946-8713 prior to pick up or delivery) for installation along the pathway and around existing trees for protection during construction.
- .2 This item does not include the supply of snow fencing but does include the supply of installation hardware and accessories as required.
- .3 This item includes the removal, transport and drop-off of snow fencing, posts and signage at the designated NCC storage facility upon completion of the contract.
- .4 This item includes a 2 year warranty on all parts supplied by the Contractor.
- .5 This item includes maintenance of the snow fence in working order for the duration of the contract.
- .6 This item will be measured and paid for on a linear metre basis.

1.4 Capping of contaminated soil

- .1 This item includes the supply and installation, including light compaction, of clean planting soil for the purpose of capping existing contaminated soil to a minimum depth of 100mm.
- .2 This item does not include the capping of soil within the snow fencing around existing trees.

- .3 This item includes pre-digging planting holes, backfilling holes with clean soil, marking holes with stakes for subsequent planting and raising the final grade of all areas 100mm above the contaminated soil.
  - .4 This item includes capping contaminated soil adjacent the existing pathway by temporarily removing the existing silt fence, removing and disposing of (on-site) the top 100mm of contaminated soil, replacing it with 100mm depth clean soil and replacing the silt fence.
  - .5 This item will be measured and paid for on a square metre basis.
- 1.5 Additional imported clean planting soil.
- .1 This item includes the supply and installation, including light compaction, of additional clean planting soil for the purpose of building up the soil depth for planting of large trees, if necessary.
  - .2 This item will be measured and paid for on a cubic metre basis.

## 2.0 SOFTSCAPE

- 2.1 Supply and install plant material
- .1 This item includes the supply and installation of deciduous and coniferous trees and shrubs of various sizes as indicated in the contract documents.
  - .2 This item includes the supply and installation of all plant accessories as indicated in the contract documents.
  - .3 This item includes the supply and installation of mulch as indicated in the contract documents.
  - .4 This item includes the maintenance and warranty of all plant material in accordance with the contract documents to ensure healthy plant material.
  - .5 This item will be measured and paid on a per unit basis as follows:
    - .1 80% of the contract planting sum, upon receipt and approval of plant materials by the Purchaser and completion of planting of all the plant materials.
    - .2 10% of the contract planting sum, after the first warranty year once the replanting of replacement material (if required) is completed.
    - .3 10% of the contract planting sum after final acceptance, following the warranty period (see 2.5 Section 32 93 10, Tree and Shrub Planting), once the replanting of replacement material (if required) is completed.
- 2.2 Supply and install seed
- .1 This item includes the supply and installation of various seed mixes as shown on the drawings.
  - .2 This item includes seed bed preparation and the supply and installation of straw to cover seeded areas.
  - .3 This item includes maintenance of seeded areas as per specification 32 92 20.
  - .4 This item will be measured and paid for on a square metre basis on the following schedule:
    - .1 90% for supply and install;



- .2 10% for satisfactory maintenance and establishment of seeded area after acceptance by the NCC Representative.
- 2.3 Supply and install sod
  - .1 This item includes the supply and installation of sod adjacent pathways as shown on the drawings.
  - .2 This item will be measured and paid for on a square meter basis on the following schedule:
    - .1 90% for supply and install;
    - .2 10% for satisfactory maintenance and establishment of sodded area after acceptance by the NCC Representative.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 TIME OF COMPLETION**

- .1 Begin work as soon as possible and complete locates, site preparation, contaminated soil capping, planting and seeding operations, installation of tree accessories and mulching requirements **on or before October 15th, 2019**. Tree maintenance is the responsibility of the Contractor until the end of the warranty period as per Section 32 93 10, Tree and Shrub Planting.

### **1.2 DESCRIPTION OF WORK**

- .1 Work under this Contract covers but is not limited to:
  - .1 Site preparation including capping of existing contaminated soil and building up of soil depths where necessary to plant large trees;
  - .2 The supply, planting, and maintenance of trees and shrubs as per the contract documents.
  - .3 The supply, installation and maintenance of seeded areas as per the contract documents.
  - .4 The maintenance, temporary removal and final removal of the existing silt fence as well as the installation, maintenance and removal of snow fencing and signage supplied by the NCC including the transport of materials to and from the designated NCC storage facility;
  - .5 The supply, installation and maintenance of the tree support systems, tree guards and winter protection in accordance with Section 32 93 10, Tree and Shrub Planting;
  - .6 The repair of any damages to assets occurring during the work as per Article 1.9 Damages;
  - .7 Drawings and specifications are complementary. Items shown or mentioned in one and not in the other are deemed to be included in the contract work.

### **1.3 DEFINITIONS**

- .1 Wherever the term "NCC representative" appears throughout these specifications, it shall be interpreted to mean an Inspector representing the National Capital Commission (NCC) or a duly named consultant on their behalf.
- .2 Wherever the terms "equal", or "approved equivalent" appear after specific types of materials and items throughout this specification, they shall be interpreted to mean being equal or superior in the opinion of the NCC representative, in material content, workmanship and quality to that designated as being the minimum acceptable standard, and his/her written approval must be obtained prior to submitting an alternative, five (5) days before close of tender.

### **1.4 COMMUNICATION**

- .1 The successful bidder shall ensure he has been informed and is aware of the official NCC representative. The only contact for the successful contractor is the official NCC representative. The contractor will be notified if the official NCC representative changes. Site problems and deficiencies shall be reported to the NCC representative immediately.

- .2 The successful bidder shall arrange with the NCC representative, in conjunction with the NCC Contracting Officer, a communication link. The communication link must be established for urgent situations which may arise during operations. Furthermore, the contractor shall identify the level of authority of his personnel. The site crew shall have a communication device in order to permit the NCC representative to communicate with them at all time during the working hours.
- .3 Provide within five (5) working days after Contract award, schedule showing anticipated progress stages and final completion of work within time period required by Contract documents.

## **1.5 CODES**

- .1 Perform work in accordance with the National Building Code of Canada 2015 and any code of provincial or municipal application. In any case of conflict or discrepancy, the more stringent requirement shall apply.
- .2 Meet or exceed requirements of:
  - .1 Contract documents;
  - .2 Specified standards, codes and referenced documents;
- .3 Obtain and pay for permits, inspector's approvals, public utilities locates, and other licenses required for this project and also pay any charges incidental to such permits. Provide copy of permits to the NCC Representative;
- .4 The NCC site access permit is necessary and will be supplied at no charge by the NCC.

## **1.6 COMPLIANCE – LAWS REGULATIONS AND PERMITS**

- .1 The Contractor will operate in accordance with all Federal, Provincial and Municipal codes and standards. Proper safety precautions must be exercised at all times, with extra precautions taken to protect the general public.
- .2 This Tender Document and the Contract resulting there from are to be interpreted, construed, governed by, and the relation between parties is to be determined in accordance with the laws of the Province of Ontario and such federal laws applicable therein.
- .3 The Contractor must obtain, at his/her cost, all the licenses and permits required in respect to the execution of the work in the province of Ontario.

## **1.7 EXISTING SERVICES**

- .1 Before commencing work, the Contractor is responsible for establishing locations and identifying extents of all utility/ service lines in area of work. Once completed, the Contractor must notify NCC representative of findings;
- .2 Contact City and Provincially approved public/ private utility providers to determine location and extents of their service lines;
- .3 Where unknown services are encountered, immediately advise NCC representative and confirm findings in writing;
- .4 Identify by use of marking paint, identification flags or other standard industry approved manner;
- .5 Where work involves adjusting of existing services, carry out work as directed by the NCC representative.
- .6 Repair all damage caused by work to existing public services at Contractor expenses.

## 1.8 PROTECTION

- .1 Protect existing structures against damage until completion of work.
- .2 Take all precautions to protect vegetated areas and trees from any damage.
- .3 Take all necessary precautions in order to prevent mud accumulation on asphalt roads and pathways. Clean immediately any soil accumulation.
- .4 Provide and maintain guard-rails, fences, barricades, lights and other devices required for protection of workmen and public in accordance with the requirements of provincial and Local by-law and the Canadian Construction Safety Code.
- .5 The contractor is responsible for the supply, installation and maintenance of traffic control devices necessary for the protection of the public and the work site. Traffic control must be in accordance with the Manual of Uniform Traffic Control Devices for Canada.
- .6 Contractor to keep a spill kit on site at all times.

## 1.9 DAMAGES

- .1 Damages caused to existing plant material, landscaping, lawns, roadways, pathways, structures, finishes and public utilities due to work of this contract, will be restored to their original condition, replaced or adequate compensation made to affected parties by the Contractor, as determined by NCC representative and to the satisfaction of the NCC.
- .2 It is understood that restored work includes labour, equipment and material cost.
- .3 The restored or replaced work shall be completed within seven (7) days of notification by the NCC representative.

## 1.10 EMPLOYEES

### .1 General

- .1 Any employee hired by the Contractor shall communicate in one of the two official languages of Canada, be experienced in dealing with the public, respect all health and safety requirements and regulations, and act in a manner that does not adversely affect the reputation of the NCC or its representatives and employees.
- .2 Any employee hired by the Contractor will be relieved of his/her duties and immediately replaced by the Contractor, if in the opinion of the NCC, this employee is unqualified or is acting in a manner contrary to the best interests of the NCC, the requirements of this contract, or if the employee does not meet the requirements stated above.
- .3 The Contractor shall ensure that he/she is able to demonstrate at any time to the NCC that he/she is in compliance with the experience requirements as indicated above and in 1.10.4 by providing any and all proof of work experience for all of his/her employees.

### .2 Security Risks

- .1 The Contractor shall ensure that none of the Employees of the Contractor and others for whom the Contractor is responsible and who are to perform the

Contractor's obligations under this Contract constitute a security risk and shall, at the request of the NCC, ensure that all Employees of the Contractor and others for whom the Contractor is responsible who are to perform the Contractor's obligations under this Contract complete the NCC's security screening process in order that the NCC may obtain a security assessment of that person before accessing any site included in this Contract.

- .2 There are three levels of screening: Reliable status, site access or secret. It will be determined depending on the site where the work is performed or the type of task required. At the minimum, the NCC shall require Reliability clearance. The NCC shall process the clearances once the individuals have been identified. The appointed individuals shall receive appropriate instructions and training from NCC Security.

### **.3 Work Dress**

- .1 All field employees of the Contractor shall be neatly dressed, at the Contractor's expense and wear approved safety equipment when required. All employees shall wear an appropriate standard uniform adapted to their area of activity with the company name prominently displayed (name tag).

### **.4 Training and Experience**

- .1 The Contractor shall have at least one full-time field employee/ foreperson assigned to this contract, who is certified as having successfully completed his/her post-secondary training in horticulture/arboriculture, **and** have at least five (5) years of relevant horticultural/arboriculture work experience in the field. This employee will be on site for all planting operations and be responsible for ensuring all specifications and best practices are followed. **Proof of education, certification, field experience and references shall be supplied by the contractor with submission.**
- .2 Other supportive field employees shall have appropriate experience and skills to perform the duties of the Contract with supervision. They shall have at least one (1) season of experience (such workers must be supervised at all times by horticulture-trained and certified employees/foreperson).
- .3 Unsatisfactory work, completed by unqualified tradesmen will be redone and paid for by the Contractor.

### **.5 NCC Regulations**

- .1 The Contractor shall ensure its agents and employees are familiar with and comply with *NCC Traffic and Property Regulations*, *NCC Animal Regulations* and other specific directives relating to its facilities and services.

## **1.11 PRODUCTS SUPPLIED**

- .1 Contractor's duties:
  - .1 Unless otherwise directed by NCC representative, order products in quantities and at times compatible with specifications, construction schedule and site storage capacity.

- .2 Unload the material on site and ensure proper material handling and storage.

#### **1.12 VEHICLES AND EQUIPMENT**

- .1 The Contractor shall provide all vehicles and equipment required to fulfil the contractual obligations of this Contract. This includes any vehicles and equipment and/or tools required for transportation purposes and/or for providing Maintenance services as requested in this Contract, such as watering, etc. The Contractor shall assume all risks inherent to the use of general or specialized vehicles and/or equipment. All vehicles and equipment used by the Contractor shall be kept in a clean condition, exempt of rust and shall meet all provincial safety standards. The company name shall be prominently displayed on all road vehicles. Contractor vehicles shall be parked only on hard surfaces in designated areas and not on soft surfaces such as sod and fields.
- .2 The Contractor will minimize unnecessary idling of vehicles in accordance with municipal by-laws in this matter.

#### **1.13 PAYMENT**

- .1 This is a unit price Contract. Any minor or miscellaneous items indicated on the drawings as being part of the work of this Contract must be included by the Contractor in his or her overhead and indirect charges and incorporated into the various unit rates.
- .2 The estimated quantities set forth in the tender are provisional. If the quantity of work to be done and materials to be supplied exceeds or are less than the estimated quantity, the contractor shall proceed with the work after approval by NCC representative. Payment will be made for the actual amount of work done and materials supplied at the unit prices set forth in the contract.
- .3 Upon completion of the requirements, the contractor may invoice the NCC. Terms of payment are Net 30 days.

#### **1.14 CONSTRUCTION SAFETY MEASURES**

- .1 Observe construction safety measures required by *Canadian Construction Safety Code*, Provincial Government, Worker's Compensation Board and municipal authority's. In any case of conflict or discrepancy, the more stringent requirement shall apply.

#### **1.15 DISPOSAL OF WASTE**

- .1 The NCC encourages that when possible, material shall be recovered, reused or recycled. We encourage the contractor to compost organic waste generated by this contract except for invasive plants which are to be disposed of as per item 4.1 .2 .6 of Tree and Shrub Planting or at the direction of the NCC Representative. Remaining waste must be transported to a landfill site approved and designated by the municipality.

#### **1.16 SITE VISIT**

- .1 It is highly recommended that interested parties visit the sites prior to submitting a bid.

#### **1.17 REQUIRED DOCUMENTS**

- .1 Maintain at job site, one copy of each of the following:
  - .1 Contract drawings
  - .2 Specifications
  - .3 Addenda
  - .4 Change orders and other modifications to Contract
  - .5 Copy of current and approved work schedule
  - .6 Permits

#### **1.18 GUARANTEES AND WARRANTIES**

- .1 Before completion of Work, collect all Manufacturer's guarantees and warranties, and submit to NCC Representative.
- .2 All non-planting work shall be warranted for a period of two (2) years from the date of written preliminary acceptance by the NCC Representative. A warranty inspection will be carried out at the end of the warranty period.
- .3 All planting work shall be warranted according to specification 32 93 10.

#### **PART 2 - PRODUCTS**

- .1 Not used

#### **PART 3 - EXECUTION**

- .1 Not used

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by NCC Representative are specified under various sections.

### **1.02 APPOINTMENT AND PAYMENT**

- .1 NCC Representative will appoint and pay for services of testing laboratory except as follows:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's convenience.
  - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  - .4 Mill tests and certificates of compliance.
  - .5 Tests specified to be carried out by Contractor under supervision of NCC Representative.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by NCC Representative to verify acceptability of corrected work.

### **1.03 CONTRACTOR'S RESPONSIBILITIES**

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

## **PART 2 - PRODUCTS**

- .1 Not used

## **PART 3 - EXECUTION**

- .1 Not used

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.01 SECTION INCLUDES**

- .1 Shop drawings and product data
- .2 Samples
- .3 Certificates and transcripts

### **1.02 ADMINISTRATIVE**

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

### **1.03 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

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

- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.

#### **1.04 SAMPLES**

- .1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to NCC Representative's business address.
- .3 Notify NCC Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by NCC Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to NCC Representative prior to proceeding with Work.
- .6 Make changes in samples which NCC Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

#### **1.05 PHOTOGRAPHIC DOCUMENTATION**

- .1 When requested by NCC Representative, submit electronic colour digital photography in jpg format at standard resolution as work progresses and at milestones or to indicate issues.
- .2 Project identification: name and number of project and date of exposure indicated.

#### **PART 2 - PRODUCTS**

- .1 Not used

#### **PART 3 - EXECUTION**

- .1 Not used

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.01 CONTAMINATED SOIL**

- .1 All soil at the site is considered to be contaminated.
- .2 Previous investigations at these sites found contaminants of concern including, but not limited to, metals and inorganics (barium, free cyanide, boron, antimony, lead), polycyclic aromatic hydrocarbons (PAH), petroleum hydrocarbons (PHC) in soil at concentrations above Federal and/or Provincial guidelines and standards. The following report is provided in Appendix A: Soils Sampling – Buckthorn Removal, Remic Rapids, Ottawa, Ontario by DST Consulting Engineers

### **1.02 SEQUENCING AND SCHEDULING**

- .1 Do not commence work involving contact with potentially or known contaminated materials until sediment and erosion control measures are in place and approved by the NCC Representative.

### **1.03 SUBMITTALS**

- .1 See Specification Section 01 35 30, Health and Safety, for Health and Safety Plan requirement.

### **1.04 NOTIFICATION**

- .1 Various Government agencies may be on-site during construction to ensure compliance with requirements. Contractor shall provide timely and easy access.

## **PART 2 – PRODUCTS**

Not used

## **PART 3 - EXECUTION**

### **3.01 EQUIPMENT DECONTAMINATION FACILITY**

- .1 Prior to commencing work, designate area(s) of the site for equipment and personnel decontamination and have available materials and equipment to decontaminate machinery and personnel in order to avoid spreading of contaminated material around and/or off-site.
- .2 Decontamination area(s) shall be approved by the NCC Representative.
- .3 Cleaning shall occur either directly over exposed contaminated soil areas or over a temporary decontamination facility (e.g. temporary gravel pad).
- .4 Decontamination area(s) must be capped with a minimum of 100mm of clean material following completion of the work.

### **3.02 STOCKPILING FACILITIES**

- .1 Provide and maintain a stockpiling area for clean capping material to avoid cross contamination with exposed contaminated soil.
- .2 Provide tarpaulins to ensure stockpiling material remains clean at all times.
- .3 Where possible, avoid the requirement for prolonged soil stockpiling. Provide, maintain and operate stockpiling areas as required, in a manner consistent with the Erosion and Sediment Control measures implemented at the Site.

### **3.03 VEHICULAR ACCESS AND PARKING**

- .1 Prevent contamination of access roads. Immediately collect debris or material on access roads. Clean access roads regularly. The NCC Representative will have the right to require that additional cleaning of access roads be completed, if deemed necessary.
- .2 Only construction equipment and vehicles requiring access to the work area will be permitted to travel on pathways or ground surface within the work area.

### **3.04 EQUIPMENT DECONTAMINATION**

- .1 Commence work involving contact with contaminated materials only after approval of the decontamination area(s), and all materials and equipment required for equipment and personnel decontamination are present on site.
- .2 Decontaminate tools, machinery, equipment and personnel after working in contaminated work areas and prior to subsequent work or travel on clean areas and prior to leaving the Site.
- .3 Perform equipment and personnel decontamination in area(s) designated for decontamination. As a minimum precaution, perform the following steps during equipment decontamination:
  - .1 Mechanically remove packed dirt, grit and debris by scraping and brushing, without using steam or water to avoid risk of spreading contamination on surrounding land and/or risk of contaminated runoff moving toward the Ottawa River or storm sewers.
  - .2 Pay particular attention to tire treads, equipment tracks, springs, joints, sprockets and undercarriages.
  - .3 Perform assessment, as directed by the NCC Representative, to determine effectiveness of decontamination.

### **3.05 DUST CONTROL MEASURES**

- .1 Instruct workers on dust control methods.
- .2 Monitor conditions, including wind, and adjust excavation rate and soil handling to minimize dust emissions.
- .3 Prevent dust from spreading to adjacent property sites.

- .4 Implement and maintain dust and particulate control measures, as deemed necessary by the NCC Representative during construction and in accordance with federal, provincial and municipal regulations.
- .5 Use potable water for misting for dust and particulate control, as required, and only with the NCC Representative's prior written approval.
- .6 Supply and have available at all times suitable dust suppressant equipment to control and prevent dust on the work site.

### **3.06 EXCAVATION**

- .1 The Contractor shall limit any excavations to the least extent feasible adjacent the existing pathway.
- .2 Excavated soil is to be relocated and capped on-site per the Contract Documents.
- .3 No excavated soil is to leave the site.

### **3.07 EROSION, SEDIMENT AND WATER CONTROL**

- .1 Maintain the existing silt fence in working order.
- .2 No water from the site may be pumped into waterways, sewer or drainage systems.

### **3.08 REMOVAL AND DISPOSAL**

- .1 Dispose of following materials at appropriate off-site facility identified by the Contractor and approved by the NCC Representative: debris including excess construction material, non-contaminated litter and rubbish; disposable personal protective equipment.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.01 REFERENCE STANDARDS**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures:
  - .1 Name of on-site Health and Safety Officer if it is someone other than site construction supervisor, and alternates responsible for site safety and health, hazards present on site and use of personal protective equipment.
  - .2 Written site-specific Health and Safety Plan prior to award of contract. This plan must be implemented, maintained, and enforced until final demobilization from site. The NCC Representative may respond in writing, where deficiencies or concerns are noted in the proposed Plan and may request re-submission with correction of deficiencies or concerns. The Health and Safety Plan must include:
    - .1 Results of safety and health risk or hazard analysis for site tasks and operation found in the scope of work at section 01 10 00.
    - .2 Decontamination procedures for both personnel and equipment if different than those provided in Section 01 35 15 Special Procedures for NCC approval prior to the issuance of a Land Access Permit.
  - .3 Submit copies of incident and accident reports immediately to NCC Representative.

### **1.03 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.
- .2 See Specification Section 01 35 15, Special Procedures, for additional requirements pertaining to work in areas of contaminated soils.
- .3 Check site for hazardous plants listed below and familiarize workers with information sheets provided.
  - .1 Common Buckthorn
  - .2 Poison Ivy
  - .3 Stinging Nettle
  - .4 Tick Safety
  - .5 West Nile Virus
  - .6 Wild Parsnip
  - .7 Giant Hogweed
- .4 The Remic Rapids site may flood in the spring. Work to commence once flood waters recede and the site is determined to be safe and accessible.

#### **1.04 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

#### **1.05 COMPLIANCE REQUIREMENTS**

- .1 Comply with Ontario Health and Safety Act and Regulations for Construction Projects.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

#### **1.06 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occurs or becomes evident during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Ontario and advise NCC Representative verbally and in writing.

#### **1.07 POSTING OF NOTICES**

1. Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Ontario having jurisdiction, and in consultation with NCC Representative.

#### **1.08 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by NCC Representative.
- .2 Provide NCC Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 NCC Representative may stop Work if non-compliance of health and safety regulations is not corrected.

#### **1.09 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

#### **1.10 PERSONNEL HEALTH, SAFETY AND HYGIENE**

- .1 Training: Ensure personnel entering site are trained in accordance with specified personnel training requirements.
- .2 Personnel shall not eat or smoke near areas of excavation and grubbing due to the



presence of contaminated soils. Wash hands to remove contaminated soil prior to eating.

**PART 2 - PRODUCTS**

.1 Not used

**PART 3 - EXECUTION**

.1 Not used

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.01 SEQUENCING AND SCHEDULING**

- .1 Do not commence work involving contact with potentially or known contaminated materials until sediment and erosion control measures are in place and approved by the NCC Representative.

### **1.02 CONTAMINATED SOILS**

- .1 See Specification Section 01 35 15, Special Procedures for additional requirements pertaining to work in areas of contaminated soil.

### **1.03 FIRES**

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

### **1.04 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Minimize stripping of topsoil and vegetation.
- .4 Do not remove trees unless authorized in writing by NCC Representative.

### **1.05 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Waterways to be kept free of excavated fill, waste material and debris at all times.

### **1.06 POLLUTION CONTROL**

- .1 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

### **1.07 WILDLIFE PROTECTION**

- .1 To avoid any adverse effects on active nests of birds protected under the Migratory Birds Convention Act (MBCA), the NCC Representative will ensure that an area search for evidence of nesting is conducted a maximum of 48 hours prior to the activities by a skilled and experienced observer using appropriate methodology as recommended by Environment Canada. If one or more nests containing eggs or chicks of migratory birds are spotted or discovered during this survey, the NCC will develop an action plan and share it with the contractor when work begins.

- .2 If one or more nests containing eggs or chicks of migratory birds are spotted or discovered during the work, the contractor must stop any disruptive activity in the nesting area and contact the NCC Representative immediately to discuss mitigation measures to be put in place.
- .3 Any wildlife incidentally encountered during activities will not be knowingly harmed and must be able to safely leave on its own.

#### **1.08 HISTORICAL / ARCHAEOLOGICAL CONTROL**

- .1 The NCC archaeologist will document known archaeological sites prior to the commencement of this contract.
- .2 NCC Heritage Program staff will provide the contractor with a map showing the locations of the known archaeological sites that were investigated. If any archaeological resources or human remains are discovered anywhere else on the site during excavation and planting, all work at the location must be halted immediately and the NCC Heritage Program must be notified at [Archaeology-Archeologie@ncc-ccn.ca](mailto:Archaeology-Archeologie@ncc-ccn.ca). Work shall not be resumed at that location until measures for the protection of those resources have been put in place.

#### **1.09 NOTIFICATION**

- .1 Various Government agencies may be on-site during construction to ensure compliance with requirements. Contractor shall provide timely and easy access.

#### **PART 2 – PRODUCTS**

- .1 Not used

#### **PART 3 – EXECUTION**

- .1 Not used

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.01 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by NCC Representative. Do not burn waste materials on site
- .3 Clear snow and ice from access.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling.
- .7 Dispose of waste materials and debris off site. See Waste Management and Disposal section, below.
- .8 Clean areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate nearby building systems.

### **1.02 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including subs waste.
- .5 Remove waste materials from site at regularly scheduled times.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for

disposal of waste and debris.

- .7 Remove stains, spots, marks and dirt from surfaces.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .9 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .10 Remove dirt and other disfiguration from exterior surfaces.
- .11 Sweep and wash clean paved areas.

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

- .1 Manage contaminated soil and excavated material in accordance with the Province of Ontario Regulation 347: General – Waste Management. Please refer to Specification 01 35 15, Special Procedures for further references and detail.
- .2 Haulage operations shall be performed in accordance with applicable municipal, provincial and federal laws and regulations.
- .3 The Contractor shall comply with municipal and provincial restrictions concerning truck loads during the spring thaw period of the territories the trucks have to travel through for off-Site disposal of materials.
- .4 Separate uncontaminated waste materials for reuse and/or recycling.

### **PART 2 - PRODUCTS**

- .1 Not used

### **PART 3 - EXECUTION**

- .1 Not used

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 TESTING**

- .1 Obtain NCC Representative's initial approval of imported topsoil at source.
- .2 Contractor is responsible to obtain soil analysis and requirements for amendments to supply topsoil as specified.
- .3 If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by NCC Representative at no cost to the Owner. Pay costs for retesting and re-inspection.
- .4 All samples and test results shall be clearly marked to indicate the Contractor's name, the date tested, type of topsoil specified and the contract for which it is to be used. Provide samples of all types indicated in materials.
- .5 Test imported topsoil for N, P K, Mg, trace minerals, soluble salt content, organic matter, soil texture and pH value prior to delivery to site.
  - .1 Submit 0.5 kg sample of topsoil to testing laboratory and indicate intended use.
  - .2 Determine requirements for amendments to bring pH value within range specified below.
  - .3 Submit two copies of soil analysis and recommendations for corrections to NCC Representative. Recommendation(s) to include for application prior to seeding or planting and recommendation(s) for maintenance application.
  - .4 Inspections and testing of topsoil will be carried out by testing laboratory designated by NCC Representative.
  - .5 National Capital Commission will pay cost of testing.
- .6 Employment of inspection/testing agencies does not relax the responsibility to perform Work in accordance with the Contract Documents.

### **1.2 REFERENCES**

- .1 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).
- .2 ASTM F1815-97, Test Method for Bulk Density.
- .3 84-001, 84-002, 84-003 Analytical Methods Manual Agricultural Canada, 1984, testing of soil pH conductivity.
- .4 84-004 Analytical Methods Manual Agricultural Canada, 1984, testing of mineral content in soil (K, Mg).
- .5 84-017 Analytical Methods Manual Agricultural Canada, 1984, testing of phosphorous content in soil.
- .6 S-9.20 Western States laboratory proficiency testing program soil and plant

analytical methods, version 4.00, 1997 for organic matter content in soil.

### **1.3 QUALITY ASSURANCE**

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

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

- .1 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.
- .2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

### **1.5 SCHEDULING OF WORK**

- .1 Schedule placing of topsoil to permit immediate planting operations and to ensure all contaminated soil is covered with a minimum of 100mm clean soil upon completion of contract.

### **1.6 DELIVERY AND STORAGE**

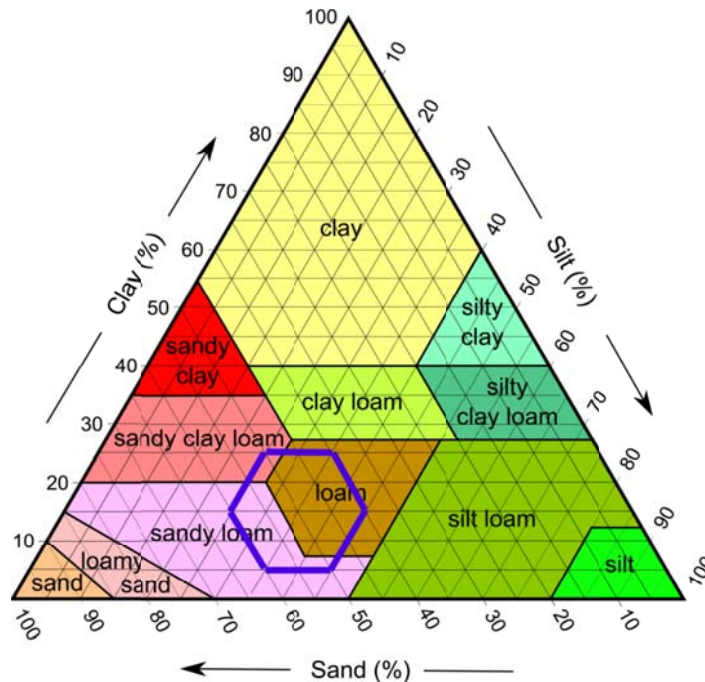
- .1 Deliver and store clean topsoil in a manner that does not contaminate it with existing contaminated soil.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Imported topsoil: mixture of mineral particulates, micro-organisms and organic matter, which provides suitable medium for supporting intended plant growth.
  - .1 Soil texture based on The Canadian System of Soil Classification
    - .1 Friable loam / sandy loam with the following parameters: 40 to 60% sand, 25 to 45% silt, 5 to 25% clay.
    - .2 Containing 5%-10% organic matter **by weight**.
  - .2 Fertility: macro and micro soil nutrients adequate to support germination and establishment of intended vegetation. Adjust topsoil nutrients to meet analysis recommendations.
  - .3 pH value: 5.5 to 6.5 .
  - .4 Contain no toxic elements or growth-inhibiting materials.
  - .5 Free from:
    - .1 Debris and stones over 50mm diameter.

- .2 Course vegetative material, 10mm diameter and 100mm length, occupying more than 2% of soil volume.
- .3 Couch grass, crab grass or other noxious weeds.
- .6 Consistency: friable when moist.



## 2.2 SOIL AMENDMENTS

- .1 Organic matter: compost Category A, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .7 Aged (minimum 2 years) mushroom compost, leaf mold, humus peat, or similar approved material. Soluble salt content must not exceed 1.0 ms/cm.
- .8 Free of wood and deleterious material which could prohibit growth.
- .2 Lime: Ground agricultural limestone containing minimum 85% of total carbonates, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve by weight.
- .3 Sulphur: Horticultural Grade.
- .4 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.
  - .1 Fertility: major soil nutrients present in following amounts:
  - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
  - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
  - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
  - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended



- vegetation.
- .6 Ph value: 6.0-7.0.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- .1 Uneven areas and low spots are advantageous. Do not grade the subgrade except to allow drainage from the existing culvert in the southwest corner to the lowest area, and immediately adjacent to the pathway.

### **3.2 SPREADING OF TOPSOIL TO CAP CONTAMINATED SOIL**

- .1 See Specification 01 35 15, Special Procedures, for additional considerations for working in areas of contaminated soil.
- .2 Do not spread topsoil until NCC Representative has inspected and approved subgrade.
- .3 Do not mix clean topsoil with contaminated subgrade.
- .4 Spread topsoil with adequate moisture in uniform layers during dry weather over approved, dry, unfrozen subgrade.
- .5 Apply topsoil to the following minimum depths:
  - .1 100mm for all areas below the 100 year floodline
  - .2 Minimum 100mm above the floodline as indicated on the drawings.
- .6 Remove stones, roots, grass, weeds, construction materials, debris and foreign non-organic objects from topsoil.
- .7 Lightly compact topsoil and ensure final compacted depth is minimum 100mm.

### **3.3 SOIL AMENDMENTS**

- .1 If required, apply lime, sulphur or other soil amendment at rate determined from soil sample test.
- .2 Mix soil amendment well into full depths of topsoil by cultivating prior to application of fertilizer.

### **3.4 ACCEPTANCE**

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

### **3.5 SURPLUS MATERIAL**

- .1 Dispose of uncontaminated surplus imported topsoil not required for fine grading/landscaping off site.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.01 SCHEDULING**

- .1 Schedule seeding to coincide with preparation of soil surface.
- .2 Schedule seed installation when frost is not present in ground.
- .3 Sowing shall be done during the following periods:
  - .1 Between April 15 and June 15;
  - .2 Between August 15 and October 15.
  - .3 Dormant seeding after November 1st when daytime temperatures are consistently below 5°C.

### **1.02 QUALITY ASSURANCE**

- .1 Submit in accordance with submittal procedures the following:
  - .1 Product data for seed mixes.

## **PART 2 - PRODUCTS**

### **2.01 SEED**

- .1 Names and sources of seed mixes can be found in the Seeding Schedule on the drawing L1- Remic Rapids Planting Plan, or approved equivalent.
- .2 Packages will be individually labeled in accordance with 'Seeds Regulations' and indicate clearly the name of the supplier, species, content, grade and mass.

### **2.02 EQUIPMENT**

- .1 Use appropriate manual equipment. NCC Representative to approve all proposed equipment for the work.

### **2.03 TOPSOIL**

- .1 The clean soil imported to cap the existing contaminated soil is approved for use as top-dressing for seeded areas.

### **2.04 WATER**

- .1 Potable water supplied by Contractor.

### **2.05 STRAW MULCH**

- .1 Derived from wheat, barley or native grass free from weeds and weed seeds. Straw that has been used for stable bedding shall not be used.

## **PART 3 - EXECUTION**

### **3.01 WORKMANSHIP**

- .1 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .2 Additional care shall be taken when seeding adjacent to watercourses or paved area to ensure that seed does not spread or blown onto those areas.

### **3.02 SEED BED PREPARATION**

- .1 Remove all weeds, clippings and debris prior to preparing the seed bed.
- .2 Just prior to seeding, loosen the soil to a depth of 2.5cm. Create microsites by sculpting minor ridges and hollows with a rake to trap moisture.
- .3 Do not carry out seed bed preparation more than 1 calendar day before seeding to avoid erosion.

### **3.03 SEEDING**

- .1 Seed must be applied to all bare areas except where indicated on the drawing L1-Remic Rapids Planting Plan.
- .2 Broadcast seed by hand or with a manual seed spreader at the rate recommended by the supplier.
- .3 Roll the seed after seeding to ensure there is good contact at the seed/soil interface.
- .4 Water seeded areas with a fine spray to a depth of 50mm.
- .5 Do not hydro-seed.
- .6 Do not fertilize.

### **3.04 STRAW MULCH**

- .1 All bare soil areas shall be stabilized with straw mulch immediately after seeding.
- .2 Apply loose straw over seed in a thin uniform layer by hand distribution. Anchor mulch in place by punching it into soil using a spade or shovel.

### **3.05 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 During the germination period and growing season, water seeded areas to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

- .2 Gully formations and washouts as a result of rain events greater than 20 mm per day shall be repaired, including regrading and re-seeding.
- .3 Control weeds by manual means utilizing acceptable integrated pest management practices.
- .4 Hand-pull undesirable vegetation before it reaches 30cm in height to prevent weed seeds from developing.

**3.06 ACCEPTANCE**

- .1 The Contractor shall maintain the seeded areas including mowing until acceptance by the NCC Representative. Unacceptable areas shall be reseeded.
- .2 Seeded areas shall be accepted by the NCC Representative provided that:
  - .1 seeded areas are adequately established;
  - .2 weeds cover no more than 20% of the seeded areas and there are no bare or dead spots;
  - .3 no surface soil is visible when grass has been cut to at a height of 15cm when standing;
- .3 Seeded areas will be accepted 2 years from the date of seeding, provided the acceptance conditions are met.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.01 SCHEDULING**

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

### **1.02 QUALITY ASSURANCE**

- .1 Submit in accordance with submittal procedures the following:
  - .1 Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity and sod quality.
  - .2 Certified reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality
- .2 Qualifications:
  - .1 Landscape Contractor: to be a Member of Landscape Ontario or the Association des Paysagistes Professionnels du Québec.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
  - .1 #1 Kentucky Bluegrass/ Fescue/Ryegrass Sod: Nursery Sod grown solely from seed in the following proportions:
    - .1 30% Sudden Impact Kentucky Bluegrass
    - .2 40% SR5250 Creeping Red Fescue.
    - .3 30% Arctic Perennial Ryegrass
  - .2 Turf Grass Nursery Sod quality:
    - .1 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 75 mm.
    - .2 Mowing height limit: 75 to 100 mm.
    - .3 Soil portion of sod: 15 mm in thickness.
- .2 Water:
  - .1 Potable water supplied by Contractor.
- .3 Fertilizer:
  - .1 Natural fertilizer 100% hen manure. Organic multipurpose natural fertilizer 5-3-2 from Acti-Sol Inc.

## **2.02 SOURCE QUALITY CONTROL**

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

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 21 - Topsoil and Fine Grading. If discrepancies occur, notify NCC Representative and commence work when instructed by NCC Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.
- .5 Cultivate fine grade approved by Contract Administrator to 25 mm depth immediately prior to sodding.
- .6 Before sodding staging areas, aerate compacted soil to a depth of 150mm.

### **3.02 SOD PLACEMENT**

- .1 Ensure sod placement is done by the Landscape Contractor.
- .2 Lay sod within 24 hours of being lifted from the nursery if air temperature exceeds 20 degrees C.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements. Avoid small pieces.
- .4 Overlapping sod will not be accepted, including at the joint between old and new sod.
- .5 Roll sod as directed by NCC Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

### **3.03 FERTILIZING PROGRAM**

- .1 Apply the fertilizer in spring following acceptance of the work.

**3.04 MAINTENANCE DURING ESTABLISHMENT AND WARRANTY PERIODS**

- .1 Perform following operations from time of installation until acceptance:
  - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
  - .2 Cut grass to 100 mm when or prior to it reaching height of 120 mm. Remove clippings which will smother grassed areas as directed by NCC Representative.
  - .3 Maintain sodded areas weed 95 % free.
  - .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
  - .5 Repair and resod dead or bare spots to satisfaction of NCC Representative.

**3.05 ACCEPTANCE**

- .1 Turf Grass Nursery Sod areas and Sport Turf areas will be accepted by NCC Representative provided that:
  - .1 Sodded areas are properly established.
  - .2 Sod is free of bare and dead spots.
  - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 100 mm.
  - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 Agriculture and Agri-Food Canada (AAFC).
  - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA)
  - .1 Canadian Standards for Nursery Stock-latest edition.

### **1.2 SCOPE OF WORK**

- .1 Provide labour, material, services and equipment necessary to complete the work of this section including but not limited to:
  - .1 Installation of tree and shrub material and plant accessories as itemized on the plant list and in accordance with specifications, details and maps.

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 The Contractor must provide the NCC Representative with confirmation of the supplier's order for the plants within two weeks of the signing of the contract.
  - .1 The confirmation of the plant order must include the following information:
    - 1. The name and address of the supplier;
    - 2. For each species of plant: quantity, height / caliper, scientific name, rooting type
- .2 Scheduling: 7 days in advance of shipment of plant material, obtain approval from NCC Representative.
  - .1 Schedule to include:
    - .1 Quantity, species and size plant material.
    - .2 Shipping dates.
    - .3 Arrival dates on site.
    - .4 Planting dates.

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

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with the species name for the plants, manufacturer's name and address for other products.
  - .1 Co-ordinate with NCC representative the shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.
  - .2 Abundant watering must be done before the plants leave the nursery or the Contractor's shop to the job sites. Regular watering should be done when the plants are stored to keep the root systems moist.
  - .3 Protect plant material from frost, excessive heat, wind and sun during delivery.
  - .4 Protect plant material from damage during transportation:
    - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
    - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
    - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where



- use of enclosed vehicle is impractical due to size and weight of plant material.
- .4 Tie branches of trees securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire which would damage bark, break branches or destroy natural shape of plant. Give full support to root ball of large trees during lifting.
- .5 Protect the trunk with a wax cardboard during transportation
- .2 Storage and Handling Requirements:
  - .1 Immediately store and protect plant material which will not be installed within 1 hour and after arrival at site in storage location approved by NCC Representative.
  - .2 Protect stored plant material from frost, wind and sun and as follows:
    - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
    - .2 For pots and containers, maintain moisture level in containers. Heel-in fibre pots.
    - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
    - .4 Store in shaded areas.

## PART 2 - PRODUCTS

### 2.1 PLANT MATERIAL SUPPLIED BY THE CONTRACTOR

- .1 Notify NCC representative of source of plant material in the next two (2) weeks following the signature of the contract and purchase order. No work under this Section is to proceed without approval.
- .2 Trees and shrubs to be from a certified nursery approved in writing by the NCC representative.
- .3 NCC representative reserves the right to inspect the plants at the source.
- .4 Obtain approval by NCC representative of plant material on site before commencing installation.
- .5 Acceptance of plant material on site or at the source does not prevent rejection prior to or after planting operations due to damage to root balls, branch structure, bark, or the like by the Contractor.
- .6 **Plants shall conform to the varieties specified in the plant list** (See Schedule of Items and Prices) and be legibly tagged with their proper name and size. No substitutions will be accepted without prior written approval of the NCC representative.

### 2.2 PLANT MATERIAL

- .1 **Size:** Refer to the Schedule of Items and Prices and planting schedules on the drawings for the plant sizes included in this contract.
- .2 **Quality:** Comply with the latest edition of the *Canadian Standards for Nursery Stock*, published by the Canadian Nursery and Landscape Association (CNLA), referring to size

and development of plant material and root ball. Measure plants when branches are in their natural position.

.3 **Source:**

- .1 Large stock deciduous and coniferous trees are to be **obtained from the same climatic zone as the National Capital Region (5a) or a lower climatic zone**, according to Agriculture Canada Plant Hardiness Zone Map;
- .2 Container stock trees and shrubs (1-7 gal) and bare root trees shall be grown from seeds collected from seed **zone 36** in accordance with the Seed Zone Boundary Map (Ontario Ministry of Natural Resources). Upon request, the supplier shall provide proof of seed collection zone (except for this proof to be requested).

.4 **Additional plant material qualifications:**

- .1 Use trees with strong fibrous root system free of disease, insects, defects or injuries and structurally sound. Use trees with straight trunks, well and characteristically branched for species. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site;
- .2 Plant material that has come out of dormant stage and is too far advanced will not be accepted unless prior approval is obtained by the NCC representative.

.5 **Container-grown stock:**

- .1 Acceptable if containers large enough for root development. Trees must have grown in container for minimum of one growing season but no longer than two. Root system must be able to 'hold' soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.

.6 **Balled and burlapped:**

- .1 Coniferous and broad-leaved evergreens over 500 mm tall must be dug with soil ball. Deciduous trees in excess of 3 m height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with wrap ball in double layer of burlap and drum lace with minimum 10 mm diameter rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.
- .2 Tree spade dug material – at source: Dig plant material with hydraulic spade or clam. Root balls to satisfy the CNLA standards or as approved by NCC representative. Lift root ball from hole, place in a standard wire basket designed for purposes and line with burlap. Replace root ball and tie basket to ball with heavy rope. Do not damage trunk of tree with basket ties or rope. **Field-collected plant materials will not be accepted.**

## 2.3 PLANT ACCESSORIES

- .1 **Water:** Free of impurities that would inhibit plant growth.
- .2 **Topsoil:** Mixture of mineral particulates, micro-organisms and organic matter which provides suitable medium for supporting intended plant growth.
  - .1 Soil texture based on The Canadian System of Soil Classification, to consist of:

- .1 Friable loam / sandy loam with the following parameters: 40 to 60% sand, 25 to 45% silt, 5 to 25% clay.
    - .2 Contain 5-10% organic matter by weight.
  - .2 Fertility: macro and micro soil nutrients adequate to support germination and establishment of intended vegetation. Adjust topsoil nutrients to meet analysis recommendations.
  - .3 pH value: 5.5 to 6.5;
  - .4 Contain no toxic elements or growth inhibiting materials;
  - .5 Free from:
    - .1 Debris and stones over 50 mm diameter;
    - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume;
    - .3 Of cut grass, crabgrass, couch grass, or other noxious weeds.
  - .6 Consistency: friable when moist.
- .3 **Staking and guying materials:**
- .1 Stakes: Wood Stake (untreated wood-spf), 50mm x 50mm x 2.44m;
  - .2 Wires: Flat, woven polypropylene: DeepRoot; \*ArborTie\*, or approved equivalent. Color: Green.
- Note: All Class C1 caliper-sized deciduous and coniferous trees 1.5m to 2.0m in height will require staking and guying. No bare root plants will require staking and guying.
- .4 **Trunk protection:**
- .1 SURTRONC from Dendrotik (1 800 653-7066) or approved equivalent. Fine mesh wrap around guard protecting against rodents and deer. The well ventilated mesh prevents development of pests and diseases. Anti-UV treated polyolefins.
- Color: Black.  
Size: diameter: 15cm  
Height : 80cm S1580 Surtronic.
- This protection will be loosely installed (not in contact with tree trunk) and joined with tie-wraps at the top, bottom and every 20cm in between (black- plus one identifier see 2.3.7) to ensure protection from both animals and other mechanical damage.
- .5 **Burlap** (winter protection): Non-treated 150 g Hessian burlap
- .6 **Wood Mulch:** Wood mulch to be supplied by the NCC. Inform NCC representative of schedule three (3) weeks in advance of mulching operations to confirm supply and arrange for pickup of materials.
- .7 **Tree Identification:** Each tree planted as a part of this contract will have a unique identifier (tie-wrap style) of a **PINK** cable tie with a minimum width of .19". This identifier will be affixed to deciduous trees on the trunk protection and conifers on a branch in the crown- not so tight as to limit growth, but visible.

## 2.4 REPLACEMENT

- .1 When replacements are required under the assigned warranty and maintenance category, it is the responsibility of the Contractor to supply a list of trees that he/she plans to replace based on warranty criteria on two occasions:
  - .1 6 months after acceptance of the planting
  - .2 1 year later.These lists will be approved by the NCC Representative who may make changes.
- .2 Regardless of warranty or maintenance categories, replace all plant material damaged by the following means:
  - .1 During loading and unloading operations;
  - .2 During transportation;
  - .3 During planting operations;
  - .4 During other works performed by the Contractor.
- .3 Not covered under the terms of the warranty are trees that die or are damaged beyond repair by mechanical means (vehicles, mowing etc.) carried out by parties other than the Contractor. This will be determined by the NCC representative and followed by site remediation (refer to section 4.1.2.2).
- .4 Replace plant material from approved source immediately if appropriate, or during the next planting season.

## 2.5 WARRANTY PERIOD

There may be a variety of warranty terms expected as part of this contract, depending on the accessibility of the planting locations for maintenance purposes and which party supplies the plant material. See the Schedule of Items and Prices for the warranty periods and maintenance requirements for each area. The terms of each warranty period category are as follows:

### WG0

- .1 As the NCC is purchasing and supplying the trees and shrubs for this area, the Contractor will not be subject to a typical two-year warranty period. However, the planting of the trees and shrubs will require the acceptance of the NCC representative at the time of the planting operations.
- .2 Please consult the Schedule of Items and Prices for the maintenance category required for areas assigned the WG0 warranty category.
- .3 Replacements are not required under this warranty category, but any plant material that has died, shows more than 30% dieback in live crown or has failed to grow or establish satisfactorily as determined by the NCC representative must be removed from site and the planting site reinstated.
- .4 The NCC representative will conduct several inspections at their discretion until the end of the two-year maintenance period, ending in the **Fall of 2021**.

#### WG1

- .1 The Contractor warrants that plant material will remain free of defects for a period of **two growing seasons** from the date of completion of planting.
- .2 The Contractor must replace any tree or shrub that shows more than 30% dieback in live crown or has failed to grow or establish satisfactorily as determined by the NCC representative
- .3 Please consult the Schedule of Items and Prices for the maintenance category required for areas or plants assigned the WG1 warranty category.
- .4 The NCC representative will conduct several inspections until the end-of-warranty period, ending in the **Fall of 2021**.
- .5 **When trees are replaced, extend warranty on replacement plant material for a period equal to the original warranty period.** Continue such replacement and warranty until plant material is acceptable.

#### WG2

- .1 The NCC representative will conduct several inspections until the end-of-warranty period, ending in the **Fall of 2021**.
- .2 During warranty period, remove from site and replace qualifying plant material (see .3 below) that has died, shows more than 30% dieback in live crown or has failed to grow or establish satisfactorily as determined by the NCC representative.
- .3 The Contractor warrants this plant material for two (2) years as such:
  - .1 A maximum of 25% of the plant total within all the planting areas of a project site can be replaced based on warranty criteria in any one warranty year per site. No carryover year to year.

#### Example:

An inventory performed in Fall 2019 of 100 trees planted in Spring 2019 reveals that thirty (30) trees qualify for replacement. Twenty-five (25) trees will be replaced in Spring 2020 (25%). In Fall 2020, an additional five (5) new trees qualify for replacement. Fall 2020 inventory reveals (5) new trees qualify for warranty replacement and five (5) new trees will be replaced in Spring 2021. All other stipulations to warranty replacements apply such as Section 2.4.

### PART 3 - EXECUTION

All Specifications below must be adhered to. Any proposed changes to these specs must be submitted at time of tender and approval required before changes are made. Any specification that is omitted will be noted, reparations made whenever possible. A warning will be given followed by an Unsatisfactory Performance Report for specifications not being followed (specific to the infraction).

#### 3.1 WORKMANSHIP

- .1 Coordinate operations. Keep site clean and planting holes drained. Immediately remove debris spilled onto pavement.
- .2 Remove surplus materials from worksite.
- .3 Tree planting and associated work will be accomplished following industry best management practices for horticulture/arboriculture in relation to tree planting, and as directed by the NCC representative.

### 3.2 PLANTING PROCEDURE

- .1 Refer to planting details on drawings.
- .2 Water 10-20 minutes before planting and again immediately after planting to prevent drying of roots.
- .3 Depth - the rootball should sit on undisturbed soil to limit any shifting or settling. It is crucial that this depth be established properly as the trees trunk flare must be above grade and the tree's uppermost structural roots should be within 25-75mm of grade.
- .4 When planting Class C2 container stock, remove entire plant from container without disturbing root ball. Non bio-degradable wrappings must be removed (wire). With balled and bur lapped root balls, loosen burlap and cut away minimum top 2/3 without disturbing root ball. Do not pull burlap or rope from under root ball.
- .5 For Class C3 bare root stock, **never** allow roots to dry out. Dig the planting hole to the diameter of the spread of the roots to a depth in the center that maintains the root collar at the elevation of the surrounding finished grade and slightly deeper along the edges of the hole. Spread all roots out radial to the trunk in the prepared hole, making the hole wider where needed to accommodate long roots. Root tips shall be directed away from the trunk. Prune any broken roots removing the least amount of tissue possible. Maintain the trunk plumb while backfilling soil around the roots. Lightly tamp the soil around the roots to eliminate voids and reduce settlement.
- .6 If there is evidence that roots are circling they should be loosened and spread out, even cut if necessary.
- .7 Backfill with excavated soil. Add topsoil (section 2.3.2) as required.
  - i. Begin backfilling around base of rootball to ensure stability and tamp (bottom 100mm of hole).
  - ii. Water to slurry and tamp in lifts of 150mm.
  - iii. Fill in and gently tamp top portion of hole.
- .8 Build a saucer around outer edge of hole to assist with maintenance watering, as per details. Rake out saucer at end of warranty period.
- .9 The Contractor is responsible for the removal of any other undesirable materials from the tree and planting site (ex: twine, rope, flagging tape, wire basket, burlap, large stones, etc.)

**\*\*If any suspected contamination at the site is discovered during excavation, the NCC must be notified immediately\*\***

For further detail on planting please consult the International Society of Arboriculture's Best Management Practises for Tree Planting.

### 3.3 TREE SUPPORT

- .1 Immediately after planting, supply and install tree supports for all Class C1 large deciduous and coniferous trees.
- .2 For trees smaller than 5 gallons, guy and stake only those plants designated by the NCC Representative. A maximum of 30% of those caliper trees may require staking.
- .3 Place stake on prevailing wind side of tree.
- .4 Drive stake minimum 500 mm into undisturbed soil beneath roots, at the outside edge of the root ball.
- .5 Ensure stake secure and vertical. Stakes will be a minimum of 1m in height but will be lower than the trees crown.

- .6 Install *DeepRoot-ArborTie* or approved equivalent. Cut off excess material.
- .7 Include tightening of guying materials to bring trees and plants to upright position.

### 3.4 MULCHING

- .1 Obtain approval of planting before mulching material is applied, if required. Spread mulch to minimum thickness as detailed on the drawings. No mulch should be piled around or in contact with the root flare of the tree. Mulch material susceptible to blowing must be moistened and mixed with topsoil before applying.
- .2 If there is enough material on-site, rake the chipped wood to form a pile in designated areas indicated by a NCC representative. Then, the Contractor must disperse these wood chips around the newly planted trees. If the on-site wood chips have all been utilized, complete the mulching process with purchased mulch after receiving approval from the NCC Representative.

### 3.5 TRUNK PROTECTION

- .1 Install trunk protection on Class C1 deciduous trees and Class C2 deciduous trees (but not shrubs).

### 3.6 TILLAGE

- .1 Where indicated in plan, till the planting surface to a depth of 300mm to loosen compacted soils. Take care not to disturb the root zones of existing trees and shrubs.

## PART 4 - MAINTENANCE

### 4.1 GENERAL

- .1 The Contractor shall prepare a maintenance schedule / tracking chart for each area with a list of all required items from the corresponding maintenance category, and a column to indicate the dates that each item is carried out. This chart template will need to be approved by the NCC Representative prior to planting and thereafter provided to the Representative every month for the duration of the maintenance period for tracking and reporting purposes.
- .2 Maintenance requirements in this contract may vary from planting area to planting area, depending on accessibility of the planting locations for maintenance purposes. See the Schedule of Items and Prices for maintenance requirements for each planting. The terms of each maintenance category are as follows:

**ME1:** Maintenance category ME1 is typically applied to planting areas with access appropriate for regular maintenance with pick-up trucks and water trucks, but consult the Schedule of Items and Prices for confirmation of the areas subject to ME1. From time of substantial acceptance by the NCC representative to end of warranty period, perform maintenance operations as described.

- .1 At no additional cost to the Commission, the Contractor shall, as soon as conditions permit during the specified planting period (spring or fall), remove and replace any trees which are not found to be in acceptable

- health or overall condition (section 2.5), as determined jointly by the Contractor and by the NCC representative, during the warranty period
- .2 Trees that die or suffer damage that will ultimately result in the death of the tree that are not covered under warranty will be removed in their entirety - this includes but is not limited to the tree, the root ball, mulch, and tree support system. The site will be remediated to its pre-planting condition- soil and seed when complete.
  - .3 Watering per Section 4.2
  - .4 Winter protection per Section 4.3
  - .5 Remove all competing vegetation to grade, once in the spring or fall following planting, and once again a year later, in a 1m diameter around each plant. The use of brush saws may be required for the removal of woody vegetation.
  - .6 All parts of invasive plants that are removed must be placed immediately into plastic garbage bags at the site of removal and then disposed of in the designated landfill. Do not stockpile or drag invasive plants around the planting site.
  - .7 For non-mulched areas, cultivate to keep top layer of soil friable;
  - .8 Repair/ replace tree support systems (stakes and ties) if required;
  - .9 Top-up or re-spread damaged or missing mulch;
  - .10 Remove dead, broken or hazardous branches from plant material;
  - .11 Keep trunk protection and tree supports in proper repair and adjustment;
  - .12 Remove and replace: dead plants; plants displaying low vigour and vitality; and if the tree's crown appears 1/3 dead. Make replacements in same manner as specified for original plantings.

**ME2:** Maintenance category ME2 is typically applied to planting areas that are too difficult for water trucks to access, but consult the Schedule of Items and Prices for confirmation of the areas subject to ME2. From time of acceptance by the NCC representative to end of warranty period, perform maintenance operations as described.

- .1 Items 1-2 and 4-11 as per ME1.
- .2 Watering will be undertaken according to section 4.2 at time of planting at the exact planting site. After initial installation, watering will **not** be expected due to lack of access.

#### 4.2 WATERING :

- .1 Apply water using a soft spray nozzle to avoid packing of the soil.
- .2 Ensure that water penetrates the soil to a depth of 300 mm in the area from the trunk to the outer extent of the dripline.
- .3 **Water as needed and confirm soil humidity using a moisture probe with gauge.** However, in order to obtain optimal results, we suggest the following watering frequency:
  - a. Water weekly from May 1<sup>st</sup> to August 31<sup>st</sup>;
  - b. During drought conditions (no rain for 3 consecutive days), water trees twice (2) weekly;



- c. Water deciduous trees biweekly from September 1<sup>st</sup> until mid-October;
  - d. Water coniferous trees biweekly from September 1<sup>st</sup> until mid-October.
  - e. After September 1<sup>st</sup>, during drought conditions (no rain for 5 consecutive days), water trees on the 6<sup>th</sup> day.
- .4 Replace and repair any sod, mulch, paving or other materials disturbed by watering procedures.
  - .5 Repair damaged watering saucers;

#### **4.3 WINTER PROTECTION**

- .1 Install winter protection (burlap) on all coniferous trees 1.5m in height or more.
- .2 To be installed beginning of December and to be removed beginning of April.
- .3 To be done every winter during the warranty period.

#### **4.4 MAINTENANCE AT THE END OF WARRANTY PERIOD**

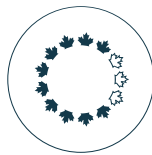
The following tasks are required for ALL maintenance and warranty categories:

- .1 At the end of warranty period, before the final inspection, remove all tree supports systems (stakes and ties), remove any weeds or grass that has grown into the mulched area, and top up all mulch to original specs.
- .2 Remove tie-wraps on tree protection and leave tree protection.
- .3 Remove all coloured cable ties identifying the trees from sites indicating a completion of contract responsibilities- with the exception of any trees that warranties have been extended on- those will be removed once warranty and maintenance obligations are fulfilled.

#### **4.5 FINAL INSPECTION AND ACCEPTANCE**

- .1 At the end of the two year warranty period, and once the Contractor has requested in writing, the NCC representative will perform the final inspection. Once final inspection is completed, and observed deficiencies or repairs required according to the NCC representative are completed, he will advise in writing that the requirements of this contract are complete and approve payment of remaining *hold back*.

**END OF SECTION**



NATIONAL CAPITAL COMMISSION  
COMMISSION DE LA CAPITALE NATIONALE

**ANNEXE A**

SOILS SAMPLING – BUCKTHORN REMOVAL, REMIC RAPIDS, OTTAWA,  
ONTARIO

By DST CONSULTING ENGINEERS

December 18, 2018

Leslie Scott MacLennan  
Environmental Officer  
National Capital Commission

Subject: Soils Sampling – Buckthorn Removal  
Remic Rapids, Ottawa, Ontario

DST File No.: GV-SO-036011

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## **1.0 INTRODUCTION**

DST Consulting Engineers Inc. (DST) was retained by National Capital Commission (NCC) to conduct Environmental Sampling of Surficial Soils within two areas where fill material was observed during the removal of buckthorn in the area of Remic Rapids along the Sir John A MacDonald Parkway in Ottawa, Ontario (the "Site"). Refer to Figure 1 in Attachment A for the Site Plan.

The subject investigation was completed strictly to assess the environmental condition of the surface soil in the study area.

## **2.0 SCOPE OF WORK**

The investigation scope of work included the following activities:

- Collecting six composite surficial soil grab samples, from depths ranging from surface to approximately 0.2 m, from each of the two areas where buckthorn removal had occurred, for laboratory analysis of petroleum hydrocarbon fractions (F1 – F4), Polycyclic Aromatic Hydrocarbons (PAHs) and metals; and,
- The preparation of a letter report documenting field observations and measurements, sampling locations, analytical sample results and subsequent compliance with environmental guidelines, and recommendations regarding additional work, as required.

## **3.0 REGULATORY FRAMEWORK**

Soil analytical results were compared against applicable federal guidelines and provincial standards. The guidelines/standards used during this investigation are set out in the following documents:

### **SOIL:**

- Canadian Council of Ministers of the Environment (CCME), "Canadian Environmental Quality Guidelines", 1999 (as amended). Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (for parkland land use and coarse-grained soil);

- CCME “Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil”, 2001, revised January 2008 (for parkland land use and coarse-grained soil); and,
- Ontario Ministry of the Environment and Climate Change (MOECC), "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011. Table 9: Generic Site Condition Standards for Use within 30 m of a Water Body in a Non-Potable Groundwater Condition.

## 4.0 SUMMARY OF FIELD PROGRAM AND METHODOLOGY

### 4.1 Soil Sampling

On December 3<sup>rd</sup>, 2018, six composite surficial soil samples were collected by DST field personnel from two disturbed areas where buckthorn removal had occurred. The samples were collected by means of a hand shovel, at depths ranging from approximately 0.05 to 0.2 m below ground surface (mbgs). The soil samples were logged in the field for texture, odour, moisture and visual appearance (staining) and placed directly into laboratory-supplied containers. Soil sample identifications and analyses are presented in Table 4-1.

**Table 4-1: Summary of Soil Samples Submitted for Laboratory Analysis**

Sample ID	Sample Depth (mbgs)	Analyses Performed
36011-01	0.05 – 0.2	PHCs F1 – F4, PAHs, metals
36011-02	0.05 – 0.2	PHCs F1 – F4, PAHs, metals
36011-03	0.05 – 0.2	PHCs F1 – F4, PAHs, metals
36011-04	0.05 – 0.2	PHCs F1 – F4, PAHs, metals
36011-05	0.05 – 0.2	PHCs F1 – F4, PAHs, metals
36011-06	0.05 – 0.2	PHCs F1 – F4, PAHs, metals

The approximate areas of soil sampling are illustrated on Figure 1, in Attachment A.

### 4.2 Analytical Testing

Soil samples were submitted to Maxxam Analytics Inc. (Maxxam) for chemical analyses. Maxxam is a Canadian Association for Laboratory Accreditation Inc. (CALA) and Standards Council of Canada (SCC) certified laboratory.

## **5.0 QUALITY ASSURANCE/ QUALITY CONTROL (QA/QC)**

DST maintains a standard Quality Assurance/ Quality Control (QA/QC) program for environmental investigations. The field sampling and QA/QC program was completed in accordance with the applicable CCME Guidance Manuals (CCME, 2016) and Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario (MOECC, 1996). All project documentation was maintained and controlled by the appointed field supervisor. All soil sampling was completed in accordance with industry standards and applicable provincial standards/guidelines.

Soil samples were placed in laboratory-supplied containers and maintained at below 10°C in ice-packed coolers, under a Chain of Custody protocol, prior to being submitted for chemical analysis to a CALA/SCC certified laboratory (Maxxam).

The potential for cross-contamination between samples was minimized by washing sampling tools with phosphorous-free soap and water, followed by rinsing with distilled water, and by wearing new disposable nitrile gloves prior to the handling of each sample.

## **6.0 RESULTS**

### **6.1 Stratigraphy**

Based on the collected soil samples, the general soil stratigraphy in the study areas is characterized by a layer of saturated, disturbed topsoil (approximately 0.05 m thick) underlain by saturated loamy sand and gravel, to a depth of approximately 0.2 mbgs.

### **6.2 Field Observations**

There was no visual or olfactory evidence of petroleum or other impacts observed in any of the soil samples collected during the investigation. Both disturbed areas presented bad quality fill with red brick fragments and what appeared to be cinder block fragments. On the west side of the Remic parking entrance most of the disturbed area presented evidence of the bad quality fill material. As for the other area on the east side, approximately 1/3 of the disturbed area presented evidence of bad quality fill.

### **6.3 Analytical Results**

As noted in Section 3.0, soil analytical results were primarily compared against applicable federal guidelines, and provincial standards were applied in the absence of federal guidelines.

Based on the laboratory analytical results, DST noted the following:

#### **PHC/BTEX**

- All BTEX concentrations from both disturbed areas are below the applicable MOECC standard and CCME guideline.
- The disturbed area on the west side presents no exceedances in PHCs for both applicable MOECC standards and CCME guidelines.
- The disturbed area on the east side presents PHC F2 concentration exceedances of the applicable MOECC standard at sample locations 04 and 05, PHC F3 concentration exceedances of both applicable MOECC standards and CCME guidelines at sampling

location 05 , and PHC F4 concentration exceedances of the applicable MOECC standard at sampling location 05. .

#### PAHs

- The disturbed area on the west side presents no exceedances in PAHs for both applicable MOECC standards and CCME guidelines.
- All sample locations on the east side (samples 03 to 06) showed exceedances in PAHs for both applicable MOECC standards and CCME guidelines.

#### Metals/Inorganics

- The disturbed area on the west side presents barium and free cyanide concentrations at sample location 01, and a boron concentration at sample location 02, exceeding the applicable MOECC Table 9 standard. All the concentrations measured are below the applicable CCME guidelines.
- The disturbed area on the east side presents a barium concentration at sample location 03 as well as antimony, lead and free cyanide concentrations at sample location 06, exceeding the applicable MOECC Table 9 standard. The lead concentration at sample location 06 also exceeds the applicable CCME guideline.

Refer to Tables B-1 through B-4, in Attachment B, for the soil analytical results. The laboratory certificates of analysis are provided in Attachment C.

### **7.0 CONCLUSIONS AND RECOMMENDATIONS**

It is our understanding that these areas will be landscaped next spring. Consequently workers and ultimately, the general public can be exposed to the impacted soils. On that basis, we offer the following recommendations:

- Review the historical information that the NCC has in hand for this area, to understand the origin of the fill material;
- Conduct a large grid test pit program in order to delineate (the impacted fill material both horizontally and vertically). Roughly twenty shallow test pits would be required. Since the six soil samples presented hits for metals, PAHs and PHCs, we recommend to keep that list of analytical parameters in future field investigations in the area. Budget costing to conduct such an investigation ranges between \$ 15,000 and \$ 20,000 depending on the thickness of overburden;
- Until the ground cover is reestablished, the sediment and erosion control measures should be maintained to prevent any migration of impacted soil outside the disturbed areas, especially toward the Ottawa river, which is located only a few meters down-gradient of the disturbed areas;
- If impacted fill is to remain on site prior to the planned landscaping, proper health and safety procedures must be developed and implemented to protect any workers who may be exposed to the identified contaminants;

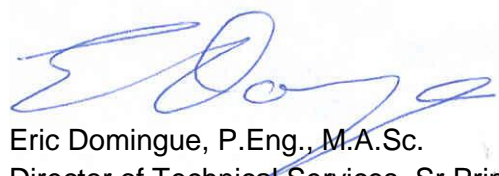
- If impacted fill is to remain on site, NCC should consider placing a soil cover on top of the disturbed area to limit direct contact of impacted soil by the general public. The disturbed area is approximately 6,600 m<sup>2</sup>. It is recommended to cover the area with 200 mm of general clean well sorted granular fill (finer than 50mm) then cover it with 50 mm of topsoil. The whole disturbed area should be hydroseeded to reinstate grass cover as soon as possible. The hydroseed mix should be approved by NCC prior to its procurement and application. The associate cost for this cover is approximately \$ 90,000 including a 20 % contingency on the area and 15 % of profit and admin for the general contractor.

## 8.0 CLOSURE

We trust that the information herein meets your present requirements. Should you have any questions, please do not hesitate to contact the undersigned at your convenience.

Sincerely,

**DST Consulting Engineers Inc.**



Eric Domingue, P.Eng., M.A.Sc.  
Director of Technical Services, Sr Principal

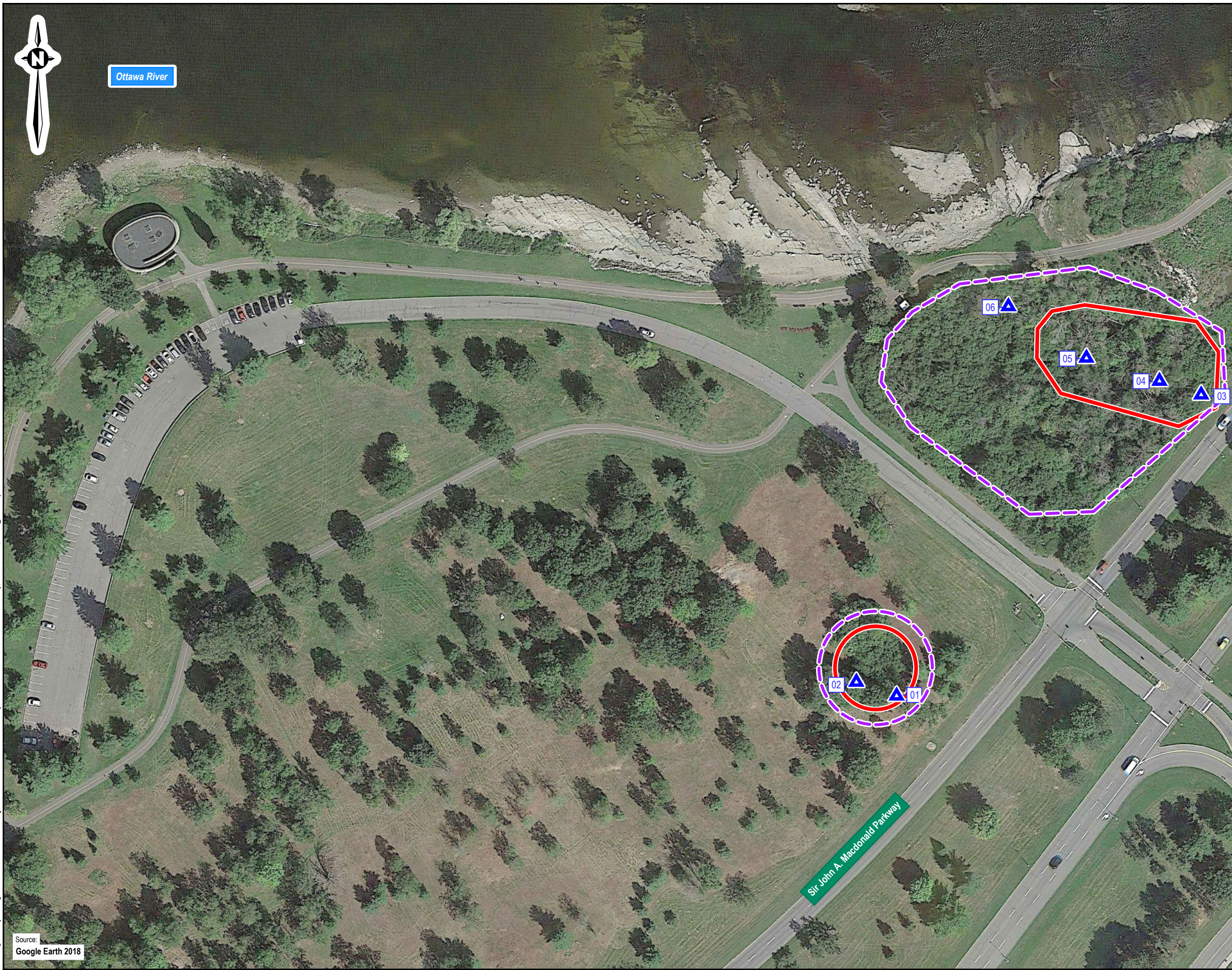
### **ATTACHMENTS:**

<b>Attachment A</b>	<b>Figure</b>
<b>Attachment B</b>	<b>Laboratory Analytical Results</b>
<b>Attachment C</b>	<b>Laboratory Certificates of Analysis</b>
<b>Attachment D</b>	<b>Limitations of Report</b>

## **ATTACHMENT A**

Figure



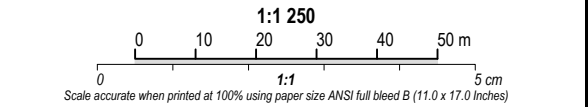


Source:  
Google Earth 2018

Drawing: 1 site plan.dwg Folder: L:\ITS\CAD\Projects\GV\GV-SO-036011 Remic Rapids\2018 Restoration\DWGs Tuesday, December 18, 2018 @ 12:51 by Kris Mornin



- Note**
1. This drawing shall be read in conjunction with the associated technical report.
- Legend**
- Approximate location of surface soil sample (DST, 2018)
  - Extent of bad quality fill material
  - Extent of disturbed soil



A	12/14/18	Final	
Revision	Date	Issue	Approval
Client			
National Capital Commission			
Site			
Ottawa, Ontario			
Report Title			
Remic Rapids Buckthorn Removal			
Drawing Title			
Sample Location Plan			
Designed By		Scale	
A.C.		As shown	
Drawn By		Date	
K.M.		2018/12/14	
Approved By		Project No.	
E.D.		GV-SO-036011	
Figure No.		1	



## **ATTACHMENT B**

### Laboratory Analytical Results

**Table B-1: Soil Analytical Results - Petroleum Hydrocarbons (PHCs) and BTEX**

Parameter Description	Guidelines/Standards		Analytical Results (Sample ID / Depth / Sampling Date m/d/y)					
	CCME (Parkland)	MOECC Table 9 (Parkland)	36011-01 (0.05 to 0.2 mbgs) 12/03/2018	36011-02 (0.05 to 0.2 mbgs) 12/03/2018	36011-03 (0.05 to 0.2 mbgs) 12/03/2018	36011-04 (0.05 to 0.2 mbgs) 12/03/2018	36011-05 (0.05 to 0.2 mbgs) 12/03/2018	36011-06 (0.05 to 0.2 mbgs) 12/03/2018
<b>BTEX</b>								
Benzene	0.03 <sup>(3)</sup>	0.02	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	0.37 <sup>(3)</sup>	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	0.082 <sup>(3)</sup>	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
o-Xylene	NG <sup>(3)</sup>	NG	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
p+m-Xylene	NG <sup>(3)</sup>	NG	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylene	11 <sup>(3)</sup>	0.05	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
<b>PHCs</b>								
PHC F1 (C6-C10)	30	25	<10	<10	<10	<10	<10	<10
PHC F1 (C6-C10) - BTEX	30	25	<10	<10	<10	<10	<10	<10
PHC F2 (C10-C16)	150	10	<10	<10	<10	11	140	<10
PHC F3 (C16-C34)	300	240	<50	<50	51	180	2700	180
PHC F4 (C34-C50)	2,800	120	<50	<50	<50	71	1000	86
Reached Baseline at C50	NG	NG	Yes	Yes	Yes	Yes	Yes	Yes
PHC F4-sg (Grav. Heavy Hydrocarbons)	2,800	120	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

CCME	- All units are expressed in micrograms per gram (µg/g).
	- Canadian Council of Ministers of the Environment (CCME), "Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil", 2001 (Table 2 Revised January 2008). Residential/Parkland land use, coarse-grained soil.
MOECC	- Ontario Ministry of the Environment and Climate Change (MOECC), "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011. Table 9: Generic Site Condition Standards for Use within 30m of a Water Body in a Non-Potable Ground Water Condition. Residential/Parkland Property Use. Coarse textured soils.
	- Guideline value derived from Canadian Council of Ministers of the Environment (CCME), "Canadian Environmental Quality Guidelines", 1999 (as amended). Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Residential/Parkland I Land Use). Coarse-grained soil.
(3)	- Guideline value derived from Canadian Council of Ministers of the Environment (CCME), "Canadian Environmental Quality Guidelines", 1999 (as amended). Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Residential/Parkland I Land Use). Coarse-grained soil.
NG	- No guideline/standard available
NA	- Not analyzed
<	- Less than laboratory reportable detection limit (value indicated)
Value	- Sample result exceeds CCME guideline.
Value	- Sample result exceeds MOECC standard.

**Table B-2: Soil Analytical Results - Polycyclic Aromatic Hydrocarbons (PAHs)**

Parameter Description	Guidelines/Standards			Analytical Results (Sample ID / Depth / Sampling Date m/d/y)					
	CCME		MOECC Table 9 (Parkland)	36011-01 (0.05 to 0.2 mbgs) 12/03/2018	36011-02 (0.05 to 0.2 mbgs) 12/03/2018	36011-03 (0.05 to 0.2 mbgs) 12/03/2018	36011-04 (0.05 to 0.2 mbgs) 12/03/2018	36011-05 (0.05 to 0.2 mbgs) 12/03/2018	36011-06 (0.05 to 0.2 mbgs) 12/03/2018
	SQG <sub>HH</sub> (Parkland)	SQG <sub>E</sub> (Parkland)							
Acenaphthene	NG	0.28	0.072	<0.0050	<0.0050	0.048	0.67	5.5	0.015
Acenaphthylene	NG	320	0.093	0.0058	0.0057	0.21	0.03	0.078	0.036
Anthracene	NG	2.5	0.22	0.0061	<0.0050	0.33	1.5	9	0.16
Benzo(a)anthracene	NG	1	0.36	0.03	0.023	1.6	2.6	13	2.1
Benzo(a)pyrene	NG	0.6	0.3	0.037	0.027	1.2	1.7	9.3	2
Benzo(b,j)fluoranthene	NG	1	0.47	0.049	0.04	1.3	1.9	15	2.3
Benzo(g,h,i)perylene	NG	NG	0.68	0.042	0.036	0.52	0.74	6	1.2
Benzo(k)fluoranthene	NG	1	0.48	0.019	0.014	0.56	0.74	4.2	0.94
Chrysene	NG	6.2	2.8	0.041	0.033	1.3	2	14	1.9
Dibenz(a,h)anthracene	NG	1	0.1	0.011	0.0098	0.21	0.29	2.2	0.37
Fluoranthene	NG	15.4	0.69	0.071	0.069	3.9	6.2	41	4.1
Fluorene	NG	0.25	0.19	<0.0050	<0.0050	0.12	0.85	7.3	0.034
Indeno(1,2,3-cd)pyrene	NG	1	0.23	0.038	0.031	0.76	1	6.4	1.5
1-Methylnaphthalene	NG	NG	0.59	<0.0050	<0.0050	0.018	0.082	0.74	0.0054
2-Methylnaphthalene	NG	NG	0.59	<0.0050	<0.0050	0.036	0.12	1.1	0.0073
Methylnaphthalene, 2-(1-)	NG	NG	0.59	<0.014	<0.014	0.055	0.2	1.8	<0.014
Naphthalene	NG	0.6	0.09	<0.0050	<0.0050	0.019	0.15	1.6	0.0078
Phenanthrene	NG	0.046	0.69	0.033	0.035	1.1	4.6	73	0.42
Pyrene	NG	7.7	1	0.055	0.055	2.7	4.2	27	3.2
B[a]P TPE (SQG <sub>PH</sub> - 10 <sup>-6</sup> )	0.6	NG	NG	0.06243	0.04829	1.8502	2.6414	15.56	3.085

Notes:

CCME	- All units are expressed in micrograms per gram (µg/g).
	- Canadian Council of Ministers of the Environment (CCME), "Canadian Environmental Quality Guidelines", 1999 (as amended). Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, "Polycyclic Aromatic Hydrocarbons", 2010. Residential/Parkland Land Use - excluding the protection of freshwater life pathway.
MOECC	- Ontario Ministry of the Environment and Climate Change (MOECC), "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011. Table 9: Generic Site Condition Standards for Use within 30m of a Water Body in a Non-Potable Ground Water Condition. Residential/Parkland Property Use. Coarse textured soils.
NG	- No guideline/standard available
<	- Less than laboratory reportable detection limit (value indicated)
*	- Laboratory reportable detection limit greater than applicable guideline/standard.
Value	- Sample result exceeds CCME guideline.
Value	- Sample result exceeds MOECC standards.

Table B-3: Soil Analytical Results - Metals

Parameter Description	Standards		Analytical Results (Sample ID / Depth / Sampling Date m/d/y)					
	CCME (Parkland)	MOECC Table 9 (Parkland)	36011-01 (0.05 to 0.2 mbgs) 12/03/2018	36011-02 (0.05 to 0.2 mbgs) 12/03/2018	36011-03 (0.05 to 0.2 mbgs) 12/03/2018	36011-04 (0.05 to 0.2 mbgs) 12/03/2018	36011-05 (0.05 to 0.2 mbgs) 12/03/2018	36011-06 (0.05 to 0.2 mbgs) 12/03/2018
Antimony	20	1.3	0.34	0.37	0.22	0.37	0.64	1.4
Arsenic	12	18	3.1	3.7	2	2.6	2.9	3.6
Barium	500	220	250	220	260	150	150	190
Beryllium	4	2.5	0.56	0.52	0.35	0.4	0.41	0.6
Boron (Hot Water Soluble)	NG	1.5	1.1	2.1	0.56	0.75	0.69	0.63
Boron (Total)	NG	36	18.0	19.0	7	8.6	7.5	11
Cadmium	10	1.2	0.4	0.48	0.49	0.72	0.53	0.82
Chromium	64	70	30	27	19	22	22	37
Chromium VI	0.4	0.66	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cobalt	50	22	8.1	7.8	5.8	6.3	6.6	8.4
Copper	63	92	15	18	15	20	28	86
Lead	140	120	39	55	41	55	99	180
Mercury	6.6	0.27	0.058	0.1	0.072	0.16	0.11	0.2
Molybdenum	10	2	<0.50	<0.50	<0.50	0.51	<0.50	0.71
Nickel	45	82	21	20	12.0	13	15.000	22
Selenium	1	1.5	<0.50	0.56	<0.50	<0.50	<0.50	<0.50
Silver	20	0.50	<0.20	0.48	<0.20	<0.20	<0.20	0.21
Thallium	1	1	0.2	0.24	0.16	0.18	0.17	0.21
Vanadium	130	86	35	33	29	34	33	38
Zinc	250	290	79	85	190	240	170	280
Uranium	23	2.5	0.37	0.42	0.48	0.66	0.55	0.62

Notes:

- All units are expressed in micrograms per gram (µg/g).
- CCME - Canadian Council of Ministers of the Environment (CCME), "Canadian Environmental Quality Guidelines", 1999 (as amended). Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Commercial Land Use.
- MOECC - Ontario Ministry of the Environment and Climate Change (MOECC), "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011. Table 9: Generic Site Condition Standards for Use within 30m of a Water Body in a Non-Potable Ground Water Condition. Residential/Parkland Property Use. Coarse textured soils.
- NG - No guideline/standard available
- < - Less than laboratory reportable detection limit (value indicated)
- Value - Sample result exceeds CCME guideline.
- Value - Sample result exceeds MOECC standards.

Table B-4: Soil Analytical Results - Inorganics

Parameter Description	Standards		Analytical Results (Sample ID / Depth / Sampling Date m/d/y)					
	CCME (Parkland)	MOECC Table 9 (Parkland)	36011-01 (0.05 to 0.2 mbgs) 12/03/2018	36011-02 (0.05 to 0.2 mbgs) 12/03/2018	36011-03 (0.05 to 0.2 mbgs) 12/03/2018	36011-04 (0.05 to 0.2 mbgs) 12/03/2018	36011-05 (0.05 to 0.2 mbgs) 12/03/2018	36011-06 (0.05 to 0.2 mbgs) 12/03/2018
Conductivity (ms/cm)	NG	0.7	0.63	0.45	0.21	0.27	0.28	0.37
Fluoride	400	NG	<5	<5	<5	<5	<5	<5
PH	NG	NG	7.34	7.62	7.58	7.5	7.27	7.18
Sodium Adsorption Ratio	NG	5	0.13	0.15	0.19	0.22	0.19	0.51
Cyanide, Free	NG	0.051	0.09	0.04	0.01	0.02	0.03	0.14
Chromium VI	0.4	0.66	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

CCME	- All units are expressed in micrograms per gram (µg/g).
	- Canadian Council of Ministers of the Environment (CCME), "Canadian Environmental Quality Guidelines", 1999 (as amended). Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Commercial Land Use.
MOECC	- Ontario Ministry of the Environment and Climate Change (MOECC), "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011. Table 9: Generic Site Condition Standards for Use within 30m of a Water Body in a Non-Potable Ground Water Condition. Residential/Parkland Property Use. Coarse textured soils.
NG	- No guideline/standard available
<	- Less than laboratory reportable detection limit (value indicated)
Value	- Sample result exceeds CCME guideline.
Value	- Sample result exceeds MOECC standards.

## **ATTACHMENT C**

### Laboratory Certificates of Analysis

Your Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON

**Attention: Eric Domingue**

DST Consulting Engineers Inc  
Ottawa - Standing Offer  
2150 Thurston Dr  
Unit 203  
Ottawa, ON  
CANADA K1G 5T9

**Report Date: 2018/12/11**  
Report #: R5520845  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B8W3024**

**Received: 2018/12/03, 15:50**

Sample Matrix: Soil  
# Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Methylnaphthalene Sum	6	N/A	2018/12/07	CAM SOP-00301	EPA 8270D m
Hot Water Extractable Boron (1)	6	2018/12/07	2018/12/07	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide (1)	6	2018/12/05	2018/12/06	CAM SOP-00457	OMOE E3015 m
Conductivity (1)	5	2018/12/06	2018/12/07	CAM SOP-00414	OMOE E3530 v1 m
Conductivity (1)	1	2018/12/07	2018/12/07	CAM SOP-00414	OMOE E3530 v1 m
Hexavalent Chromium in Soil by IC (1, 2)	6	2018/12/05	2018/12/10	CAM SOP-00436	EPA 3060/7199 m
Petroleum Hydro. CCME F1 & BTEX in Soil (3)	2	N/A	2018/12/04	OTT SOP-00002	CCME CWS
Petroleum Hydro. CCME F1 & BTEX in Soil (3)	4	N/A	2018/12/05	OTT SOP-00002	CCME CWS
Petroleum Hydrocarbons F2-F4 in Soil (4)	5	2018/12/04	2018/12/04	OTT SOP-00001	CCME CWS
Petroleum Hydrocarbons F2-F4 in Soil (4)	1	2018/12/04	2018/12/05	OTT SOP-00001	CCME CWS
Soluble Fluoride analysis in Soil (1)	6	2018/12/07	2018/12/07	CAM SOP-00449	SM 23 4500 F C m
Strong Acid Leachable Metals by ICPMS (1)	5	2018/12/07	2018/12/07	CAM SOP-00447	EPA 6020B m
Strong Acid Leachable Metals by ICPMS (1)	1	2018/12/07	2018/12/10	CAM SOP-00447	EPA 6020B m
Moisture	6	N/A	2018/12/05	CAM SOP-00445	McKeague 2nd ed 1978
PAH Compounds in Soil by GC/MS (SIM)	3	2018/12/05	2018/12/05	OTT SOP-00011	EPA 8270D m
PAH Compounds in Soil by GC/MS (SIM)	3	2018/12/05	2018/12/06	OTT SOP-00011	EPA 8270D m
pH CaCl2 EXTRACT (1)	6	2018/12/06	2018/12/06	CAM SOP-00413	EPA 9045 D m
Sodium Adsorption Ratio (SAR) (1)	6	N/A	2018/12/10	CAM SOP-00102	EPA 6010C

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise



Your Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON

**Attention: Eric Domingue**

DST Consulting Engineers Inc  
Ottawa - Standing Offer  
2150 Thurston Dr  
Unit 203  
Ottawa, ON  
CANADA K1G 5T9

**Report Date: 2018/12/11**  
Report #: R5520845  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B8W3024**

**Received: 2018/12/03, 15:50**

agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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.

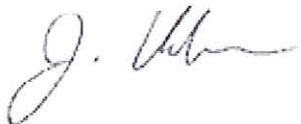
(1) This test was performed by Maxxam Analytics Mississauga

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

(3) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is the date sampled unless otherwise stated.

(4) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following "Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003". Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Encryption Key



Jonathan Urben  
Senior Project Manager  
11 Dec 2018 15:46:02

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

Jonathan Urben, Senior Project Manager

Email: jurben@maxxam.ca

Phone# (613) 274-0573

=====

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.

### CCME SOIL INORGANICS PACKAGE (SOIL)

Maxxam ID		ILM388		ILM389			ILM389		
Sampling Date		2018/12/03 09:30		2018/12/03 09:50			2018/12/03 09:50		
	UNITS	36011-02	QC Batch	36011-03	RDL	QC Batch	36011-03 Lab-Dup	RDL	QC Batch
<b>Calculated Parameters</b>									
Sodium Adsorption Ratio	N/A	0.15	5869483	0.19		5869483			
<b>Inorganics</b>									
Conductivity	mS/cm	0.45	5876470	0.21	0.002	5875742			
Fluoride (F-)	ug/g	<5	5876482	<5	5	5876482	<5	5	5876482
Available (CaCl2) pH	pH	7.62	5872357	7.58		5872357			
WAD Cyanide (Free)	ug/g	0.04	5873015	0.01	0.01	5873015			
Chromium (VI)	ug/g	<0.2	5872923	<0.2	0.2	5872923			
<b>Metals</b>									
Hot Water Ext. Boron (B)	ug/g	2.1	5876437	0.56	0.050	5876185			
Acid Extractable Antimony (Sb)	ug/g	0.37	5876175	0.22	0.20	5876175			
Acid Extractable Arsenic (As)	ug/g	3.7	5876175	2.0	1.0	5876175			
Acid Extractable Barium (Ba)	ug/g	220	5876175	260	0.50	5876175			
Acid Extractable Beryllium (Be)	ug/g	0.52	5876175	0.35	0.20	5876175			
Acid Extractable Boron (B)	ug/g	19	5876175	7.0	5.0	5876175			
Acid Extractable Cadmium (Cd)	ug/g	0.48	5876175	0.49	0.10	5876175			
Acid Extractable Chromium (Cr)	ug/g	27	5876175	19	1.0	5876175			
Acid Extractable Cobalt (Co)	ug/g	7.8	5876175	5.8	0.10	5876175			
Acid Extractable Copper (Cu)	ug/g	18	5876175	15	0.50	5876175			
Acid Extractable Lead (Pb)	ug/g	55	5876175	41	1.0	5876175			
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	5876175	<0.50	0.50	5876175			
Acid Extractable Nickel (Ni)	ug/g	20	5876175	12	0.50	5876175			
Acid Extractable Selenium (Se)	ug/g	0.56	5876175	<0.50	0.50	5876175			
Acid Extractable Silver (Ag)	ug/g	0.48	5876175	<0.20	0.20	5876175			
Acid Extractable Thallium (Tl)	ug/g	0.24	5876175	0.16	0.050	5876175			
Acid Extractable Tin (Sn)	ug/g	1.8	5876175	1.4	1.0	5876175			
Acid Extractable Uranium (U)	ug/g	0.42	5876175	0.48	0.050	5876175			
Acid Extractable Vanadium (V)	ug/g	33	5876175	29	5.0	5876175			
Acid Extractable Zinc (Zn)	ug/g	85	5876175	190	5.0	5876175			
Acid Extractable Mercury (Hg)	ug/g	0.10	5876175	0.072	0.050	5876175			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate									



### CCME SOIL INORGANICS PACKAGE (SOIL)

Maxxam ID		ILM390	ILM391			ILM391			ILM392		
Sampling Date		2018/12/03 10:10	2018/12/03 10:30			2018/12/03 10:30			2018/12/03 10:40		
	UNITS	36011-04	36011-05	RDL	QC Batch	36011-05 Lab-Dup	RDL	QC Batch	36011-06	RDL	QC Batch
<b>Calculated Parameters</b>											
Sodium Adsorption Ratio	N/A	0.22	0.19		5869483				0.51		5869483
<b>Inorganics</b>											
Conductivity	mS/cm	0.27	0.28	0.002	5875742				0.37	0.002	5875742
Fluoride (F <sup>-</sup> )	ug/g	<5	<5	5	5876482				<5	5	5876482
Available (CaCl <sub>2</sub> ) pH	pH	7.50	7.27		5872357				7.18		5872357
WAD Cyanide (Free)	ug/g	0.02	0.03	0.01	5873015				0.14	0.01	5873015
Chromium (VI)	ug/g	<0.2	<0.2	0.2	5872923				<0.2	0.2	5872923
<b>Metals</b>											
Hot Water Ext. Boron (B)	ug/g	0.75	0.69	0.050	5876185				0.63	0.050	5876185
Acid Extractable Antimony (Sb)	ug/g	0.37	0.64	0.20	5876175	0.66	0.20	5876175	1.4	0.20	5876175
Acid Extractable Arsenic (As)	ug/g	2.6	2.9	1.0	5876175	2.7	1.0	5876175	3.6	1.0	5876175
Acid Extractable Barium (Ba)	ug/g	150	150	0.50	5876175	150	0.50	5876175	190	0.50	5876175
Acid Extractable Beryllium (Be)	ug/g	0.40	0.41	0.20	5876175	0.42	0.20	5876175	0.60	0.20	5876175
Acid Extractable Boron (B)	ug/g	8.6	7.5	5.0	5876175	8.1	5.0	5876175	11	5.0	5876175
Acid Extractable Cadmium (Cd)	ug/g	0.72	0.53	0.10	5876175	0.49	0.10	5876175	0.82	0.10	5876175
Acid Extractable Chromium (Cr)	ug/g	22	22	1.0	5876175	24	1.0	5876175	37	1.0	5876175
Acid Extractable Cobalt (Co)	ug/g	6.3	6.6	0.10	5876175	6.6	0.10	5876175	8.4	0.10	5876175
Acid Extractable Copper (Cu)	ug/g	20	28	0.50	5876175	27	0.50	5876175	86	0.50	5876175
Acid Extractable Lead (Pb)	ug/g	55	99	1.0	5876175	100	1.0	5876175	180	1.0	5876175
Acid Extractable Molybdenum (Mo)	ug/g	0.51	<0.50	0.50	5876175	0.59	0.50	5876175	0.71	0.50	5876175
Acid Extractable Nickel (Ni)	ug/g	13	15	0.50	5876175	15	0.50	5876175	22	0.50	5876175
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	0.50	5876175	<0.50	0.50	5876175	<0.50	0.50	5876175
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	0.20	5876175	<0.20	0.20	5876175	0.21	0.20	5876175
Acid Extractable Thallium (Tl)	ug/g	0.18	0.17	0.050	5876175	0.19	0.050	5876175	0.21	0.050	5876175
Acid Extractable Tin (Sn)	ug/g	2.0	3.0	1.0	5876175	4.2	1.0	5876175	7.4	1.0	5876175
Acid Extractable Uranium (U)	ug/g	0.66	0.55	0.050	5876175	0.53	0.050	5876175	0.62	0.050	5876175
Acid Extractable Vanadium (V)	ug/g	34	33	5.0	5876175	35	5.0	5876175	38	5.0	5876175
Acid Extractable Zinc (Zn)	ug/g	240	170	5.0	5876175	170	5.0	5876175	280	5.0	5876175
Acid Extractable Mercury (Hg)	ug/g	0.16	0.11	0.050	5876175	0.097	0.050	5876175	0.20	0.050	5876175
RDL = Reportable Detection Limit											
QC Batch = Quality Control Batch											
Lab-Dup = Laboratory Initiated Duplicate											

### CCME SOIL INORGANICS PACKAGE (SOIL)

Maxxam ID		ILM393		
Sampling Date		2018/12/03 09:10		
	UNITS	36011-01	RDL	QC Batch
<b>Calculated Parameters</b>				
Sodium Adsorption Ratio	N/A	0.13		5869483
<b>Inorganics</b>				
Conductivity	mS/cm	0.63	0.002	5875742
Fluoride (F-)	ug/g	<5	5	5876482
Available (CaCl <sub>2</sub> ) pH	pH	7.34		5872357
WAD Cyanide (Free)	ug/g	0.09	0.01	5873015
Chromium (VI)	ug/g	<0.2	0.2	5872923
<b>Metals</b>				
Hot Water Ext. Boron (B)	ug/g	1.1	0.050	5876185
Acid Extractable Antimony (Sb)	ug/g	0.34	0.20	5876175
Acid Extractable Arsenic (As)	ug/g	3.1	1.0	5876175
Acid Extractable Barium (Ba)	ug/g	250	0.50	5876175
Acid Extractable Beryllium (Be)	ug/g	0.56	0.20	5876175
Acid Extractable Boron (B)	ug/g	18	5.0	5876175
Acid Extractable Cadmium (Cd)	ug/g	0.40	0.10	5876175
Acid Extractable Chromium (Cr)	ug/g	30	1.0	5876175
Acid Extractable Cobalt (Co)	ug/g	8.1	0.10	5876175
Acid Extractable Copper (Cu)	ug/g	15	0.50	5876175
Acid Extractable Lead (Pb)	ug/g	39	1.0	5876175
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	5876175
Acid Extractable Nickel (Ni)	ug/g	21	0.50	5876175
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	5876175
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	5876175
Acid Extractable Thallium (Tl)	ug/g	0.20	0.050	5876175
Acid Extractable Tin (Sn)	ug/g	1.1	1.0	5876175
Acid Extractable Uranium (U)	ug/g	0.37	0.050	5876175
Acid Extractable Vanadium (V)	ug/g	35	5.0	5876175
Acid Extractable Zinc (Zn)	ug/g	79	5.0	5876175
Acid Extractable Mercury (Hg)	ug/g	0.058	0.050	5876175
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



### CCME PHCS IN SOIL - OTTAWA (SOIL)

Maxxam ID		ILM388			ILM388			ILM389		
Sampling Date		2018/12/03 09:30			2018/12/03 09:30			2018/12/03 09:50		
	UNITS	36011-02	RDL	QC Batch	36011-02 Lab-Dup	RDL	QC Batch	36011-03	RDL	QC Batch
<b>Inorganics</b>										
Moisture	%	25	0.2	5870153	17	0.2	5870153	20	0.2	5870153
<b>BTEX &amp; F1 Hydrocarbons</b>										
Benzene	ug/g	<0.0050	0.0050	5870408				<0.0050	0.0050	5870408
Toluene	ug/g	<0.020	0.020	5870408				<0.020	0.020	5870408
Ethylbenzene	ug/g	<0.010	0.010	5870408				<0.010	0.010	5870408
o-Xylene	ug/g	<0.020	0.020	5870408				<0.020	0.020	5870408
p+m-Xylene	ug/g	<0.040	0.040	5870408				<0.040	0.040	5870408
Total Xylenes	ug/g	<0.040	0.040	5870408				<0.040	0.040	5870408
F1 (C6-C10)	ug/g	<10	10	5870408				<10	10	5870408
F1 (C6-C10) - BTEX	ug/g	<10	10	5870408				<10	10	5870408
<b>F2-F4 Hydrocarbons</b>										
F2 (C10-C16 Hydrocarbons)	ug/g	<10	10	5870146				<10	10	5870146
F3 (C16-C34 Hydrocarbons)	ug/g	<50	50	5870146				51	50	5870146
F4 (C34-C50 Hydrocarbons)	ug/g	<50	50	5870146				<50	50	5870146
Reached Baseline at C50	ug/g	Yes		5870146				Yes		5870146
<b>Surrogate Recovery (%)</b>										
1,4-Difluorobenzene	%	102		5870408				104		5870408
4-Bromofluorobenzene	%	98		5870408				103		5870408
D10-Ethylbenzene	%	123		5870408				119		5870408
D4-1,2-Dichloroethane	%	104		5870408				101		5870408
o-Terphenyl	%	104		5870146				99		5870146
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
Lab-Dup = Laboratory Initiated Duplicate										

Maxxam Job #: B8W3024  
Report Date: 2018/12/11

DST Consulting Engineers Inc  
Client Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON  
Sampler Initials: AC

### CCME PHCS IN SOIL - OTTAWA (SOIL)

Maxxam ID		ILM389			ILM390	ILM391	ILM392	ILM393		
Sampling Date		2018/12/03 09:50			2018/12/03 10:10	2018/12/03 10:30	2018/12/03 10:40	2018/12/03 09:10		
	UNITS	36011-03 Lab-Dup	RDL	QC Batch	36011-04	36011-05	36011-06	36011-01	RDL	QC Batch
<b>Inorganics</b>										
Moisture	%				25	26	38	40	0.2	5870153
<b>BTEX &amp; F1 Hydrocarbons</b>										
Benzene	ug/g	<0.0050	0.0050	5870408	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	5870408
Toluene	ug/g	<0.020	0.020	5870408	<0.020	<0.020	<0.020	<0.020	0.020	5870408
Ethylbenzene	ug/g	<0.010	0.010	5870408	<0.010	<0.010	<0.010	<0.010	0.010	5870408
o-Xylene	ug/g	<0.020	0.020	5870408	<0.020	<0.020	<0.020	<0.020	0.020	5870408
p+m-Xylene	ug/g	<0.040	0.040	5870408	<0.040	<0.040	<0.040	<0.040	0.040	5870408
Total Xylenes	ug/g	<0.040	0.040	5870408	<0.040	<0.040	<0.040	<0.040	0.040	5870408
F1 (C6-C10)	ug/g	<10	10	5870408	<10	<10	<10	<10	10	5870408
F1 (C6-C10) - BTEX	ug/g	<10	10	5870408	<10	<10	<10	<10	10	5870408
<b>F2-F4 Hydrocarbons</b>										
F2 (C10-C16 Hydrocarbons)	ug/g				11	140	<10	<10	10	5870146
F3 (C16-C34 Hydrocarbons)	ug/g				180	2700	180	<50	50	5870146
F4 (C34-C50 Hydrocarbons)	ug/g				71	1000	86	<50	50	5870146
Reached Baseline at C50	ug/g				Yes	Yes	Yes	Yes		5870146
<b>Surrogate Recovery (%)</b>										
1,4-Difluorobenzene	%	99		5870408	103	103	108	100		5870408
4-Bromofluorobenzene	%	93		5870408	98	101	104	96		5870408
D10-Ethylbenzene	%	104		5870408	127	116	129	128		5870408
D4-1,2-Dichloroethane	%	94		5870408	96	104	100	94		5870408
o-Terphenyl	%				106	119	109	106		5870146
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
Lab-Dup = Laboratory Initiated Duplicate										



**O.REG 153 PAHS (SOIL)**

Maxxam ID		ILM388			ILM388			ILM389	ILM390		
Sampling Date		2018/12/03 09:30			2018/12/03 09:30			2018/12/03 09:50	2018/12/03 10:10		
	UNITS	36011-02	RDL	QC Batch	36011-02 Lab-Dup	RDL	QC Batch	36011-03	36011-04	RDL	QC Batch

**Calculated Parameters**

Methylnaphthalene, 2-(1-)	ug/g	<0.014	0.014	5869700				0.055	0.20	0.014	5869700
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**Polyaromatic Hydrocarbons**

Acenaphthene	ug/g	<0.0050	0.0050	5871741	<0.0050	0.0050	5871741	0.048	0.67	0.0050	5871741
Acenaphthylene	ug/g	0.0057	0.0050	5871741	0.0054	0.0050	5871741	0.21	0.030	0.0050	5871741
Anthracene	ug/g	<0.0050	0.0050	5871741	<0.0050	0.0050	5871741	0.33	1.5	0.0050	5871741
Benzo(a)anthracene	ug/g	0.023	0.0050	5871741	0.019	0.0050	5871741	1.6	2.6	0.0050	5871741
Benzo(a)pyrene	ug/g	0.027	0.0050	5871741	0.021	0.0050	5871741	1.2	1.7	0.0050	5871741
Benzo(b,j)fluoranthene	ug/g	0.040	0.0050	5871741	0.034	0.0050	5871741	1.3	1.9	0.0050	5871741
Benzo(g,h,i)perylene	ug/g	0.036	0.0050	5871741	0.030	0.0050	5871741	0.52	0.74	0.0050	5871741
Benzo(k)fluoranthene	ug/g	0.014	0.0050	5871741	0.011	0.0050	5871741	0.56	0.74	0.0050	5871741
Chrysene	ug/g	0.033	0.0050	5871741	0.027	0.0050	5871741	1.3	2.0	0.0050	5871741
Dibenz(a,h)anthracene	ug/g	0.0098	0.0050	5871741	0.0086	0.0050	5871741	0.21	0.29	0.0050	5871741
Fluoranthene	ug/g	0.069	0.0050	5871741	0.051	0.0050	5871741	3.9	6.2	0.0050	5871741
Fluorene	ug/g	<0.0050	0.0050	5871741	<0.0050	0.0050	5871741	0.12	0.85	0.0050	5871741
Indeno(1,2,3-cd)pyrene	ug/g	0.031	0.0050	5871741	0.024	0.0050	5871741	0.76	1.0	0.0050	5871741
1-Methylnaphthalene	ug/g	<0.0050	0.0050	5871741	<0.0050	0.0050	5871741	0.018	0.082	0.0050	5871741
2-Methylnaphthalene	ug/g	<0.0050	0.0050	5871741	<0.0050	0.0050	5871741	0.036	0.12	0.0050	5871741
Naphthalene	ug/g	<0.0050	0.0050	5871741	<0.0050	0.0050	5871741	0.019	0.15	0.0050	5871741
Phenanthrene	ug/g	0.035	0.0050	5871741	0.026	0.0050	5871741	1.1	4.6	0.0050	5871741
Pyrene	ug/g	0.055	0.0050	5871741	0.041	0.0050	5871741	2.7	4.2	0.0050	5871741

**Surrogate Recovery (%)**

D10-Anthracene	%	77		5871741	77		5871741	84	97		5871741
D14-Terphenyl (FS)	%	79		5871741	94		5871741	100	102		5871741
D8-Acenaphthylene	%	97		5871741	101		5871741	95	94		5871741

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

### O.REG 153 PAHS (SOIL)

Maxxam ID		ILM391	ILM392	ILM393		
Sampling Date		2018/12/03 10:30	2018/12/03 10:40	2018/12/03 09:10		
	UNITS	36011-05	36011-06	36011-01	RDL	QC Batch
<b>Calculated Parameters</b>						
Methylnaphthalene, 2-(1-)	ug/g	1.8	<0.014	<0.014	0.014	5869700
<b>Polyaromatic Hydrocarbons</b>						
Acenaphthene	ug/g	5.5	0.015	<0.0050	0.0050	5871741
Acenaphthylene	ug/g	0.078	0.036	0.0058	0.0050	5871741
Anthracene	ug/g	9.0	0.16	0.0061	0.0050	5871741
Benzo(a)anthracene	ug/g	13	2.1	0.030	0.0050	5871741
Benzo(a)pyrene	ug/g	9.3	2.0	0.037	0.0050	5871741
Benzo(b,j)fluoranthene	ug/g	15	2.3	0.049	0.0050	5871741
Benzo(g,h,i)perylene	ug/g	6.0	1.2	0.042	0.0050	5871741
Benzo(k)fluoranthene	ug/g	4.2	0.94	0.019	0.0050	5871741
Chrysene	ug/g	14	1.9	0.041	0.0050	5871741
Dibenz(a,h)anthracene	ug/g	2.2	0.37	0.011	0.0050	5871741
Fluoranthene	ug/g	41	4.1	0.071	0.0050	5871741
Fluorene	ug/g	7.3	0.034	<0.0050	0.0050	5871741
Indeno(1,2,3-cd)pyrene	ug/g	6.4	1.5	0.038	0.0050	5871741
1-Methylnaphthalene	ug/g	0.74	0.0054	<0.0050	0.0050	5871741
2-Methylnaphthalene	ug/g	1.1	0.0073	<0.0050	0.0050	5871741
Naphthalene	ug/g	1.6	0.0078	<0.0050	0.0050	5871741
Phenanthrene	ug/g	73	0.42	0.033	0.0050	5871741
Pyrene	ug/g	27	3.2	0.055	0.0050	5871741
<b>Surrogate Recovery (%)</b>						
D10-Anthracene	%	109	78	77		5871741
D14-Terphenyl (FS)	%	104	98	81		5871741
D8-Acenaphthylene	%	99	99	100		5871741
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						



Maxxam Job #: B8W3024  
Report Date: 2018/12/11

DST Consulting Engineers Inc  
Client Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON  
Sampler Initials: AC

## TEST SUMMARY

Maxxam ID: ILM388  
Sample ID: 36011-02  
Matrix: Soil

Collected: 2018/12/03  
Shipped:  
Received: 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5869700	N/A	2018/12/07	Lilliana Gaburici
Hot Water Extractable Boron	ICP	5876437	2018/12/07	2018/12/07	Azita Fazaeli
Free (WAD) Cyanide	TECH	5873015	2018/12/05	2018/12/06	Louise Harding
Conductivity	AT	5876470	2018/12/07	2018/12/07	Kazzandra Adeva
Hexavalent Chromium in Soil by IC	IC/SPEC	5872923	2018/12/05	2018/12/10	Sally Norouz
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	5870408	N/A	2018/12/04	Fatemeh Habibagahi
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5870146	2018/12/04	2018/12/04	Mariana Vascan
Soluble Fluoride analysis in Soil	ISE	5876482	2018/12/07	2018/12/07	Neil Dassanayake
Strong Acid Leachable Metals by ICPMS	ICP/MS	5876175	2018/12/07	2018/12/10	Matthew Ritenburg
Moisture	BAL	5870153	N/A	2018/12/05	Mariana Vascan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5871741	2018/12/05	2018/12/05	Lilliana Gaburici
pH CaCl2 EXTRACT	AT	5872357	2018/12/06	2018/12/06	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5869483	N/A	2018/12/10	Automated Statchk

Maxxam ID: ILM388 Dup  
Sample ID: 36011-02  
Matrix: Soil

Collected: 2018/12/03  
Shipped:  
Received: 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5870153	N/A	2018/12/05	Mariana Vascan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5871741	2018/12/05	2018/12/05	Lilliana Gaburici

Maxxam ID: ILM389  
Sample ID: 36011-03  
Matrix: Soil

Collected: 2018/12/03  
Shipped:  
Received: 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5869700	N/A	2018/12/07	Lilliana Gaburici
Hot Water Extractable Boron	ICP	5876185	2018/12/07	2018/12/07	Azita Fazaeli
Free (WAD) Cyanide	TECH	5873015	2018/12/05	2018/12/06	Louise Harding
Conductivity	AT	5875742	2018/12/06	2018/12/07	Kazzandra Adeva
Hexavalent Chromium in Soil by IC	IC/SPEC	5872923	2018/12/05	2018/12/10	Sally Norouz
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	5870408	N/A	2018/12/04	Fatemeh Habibagahi
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5870146	2018/12/04	2018/12/04	Mariana Vascan
Soluble Fluoride analysis in Soil	ISE	5876482	2018/12/07	2018/12/07	Neil Dassanayake
Strong Acid Leachable Metals by ICPMS	ICP/MS	5876175	2018/12/07	2018/12/07	Matthew Ritenburg
Moisture	BAL	5870153	N/A	2018/12/05	Mariana Vascan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5871741	2018/12/05	2018/12/06	Lilliana Gaburici
pH CaCl2 EXTRACT	AT	5872357	2018/12/06	2018/12/06	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5869483	N/A	2018/12/10	Automated Statchk

Maxxam Job #: B8W3024  
Report Date: 2018/12/11

DST Consulting Engineers Inc  
Client Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON  
Sampler Initials: AC

## TEST SUMMARY

Maxxam ID: ILM389 Dup  
Sample ID: 36011-03  
Matrix: Soil

Collected: 2018/12/03  
Shipped:  
Received: 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	5870408	N/A	2018/12/05	Fatemeh Habibagahi
Soluble Fluoride analysis in Soil	ISE	5876482	2018/12/07	2018/12/07	Neil Dassanayake

Maxxam ID: ILM390  
Sample ID: 36011-04  
Matrix: Soil

Collected: 2018/12/03  
Shipped:  
Received: 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5869700	N/A	2018/12/07	Lilliana Gaburici
Hot Water Extractable Boron	ICP	5876185	2018/12/07	2018/12/07	Azita Fazaali
Free (WAD) Cyanide	TECH	5873015	2018/12/05	2018/12/06	Louise Harding
Conductivity	AT	5875742	2018/12/06	2018/12/07	Kazzandra Adeva
Hexavalent Chromium in Soil by IC	IC/SPEC	5872923	2018/12/05	2018/12/10	Sally Norouz
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	5870408	N/A	2018/12/05	Fatemeh Habibagahi
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5870146	2018/12/04	2018/12/04	Mariana Vascan
Soluble Fluoride analysis in Soil	ISE	5876482	2018/12/07	2018/12/07	Neil Dassanayake
Strong Acid Leachable Metals by ICPMS	ICP/MS	5876175	2018/12/07	2018/12/07	Matthew Ritenburg
Moisture	BAL	5870153	N/A	2018/12/05	Mariana Vascan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5871741	2018/12/05	2018/12/06	Lilliana Gaburici
pH CaCl2 EXTRACT	AT	5872357	2018/12/06	2018/12/06	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5869483	N/A	2018/12/10	Automated Statchk

Maxxam ID: ILM391  
Sample ID: 36011-05  
Matrix: Soil

Collected: 2018/12/03  
Shipped:  
Received: 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5869700	N/A	2018/12/07	Lilliana Gaburici
Hot Water Extractable Boron	ICP	5876185	2018/12/07	2018/12/07	Azita Fazaali
Free (WAD) Cyanide	TECH	5873015	2018/12/05	2018/12/06	Louise Harding
Conductivity	AT	5875742	2018/12/06	2018/12/07	Kazzandra Adeva
Hexavalent Chromium in Soil by IC	IC/SPEC	5872923	2018/12/05	2018/12/10	Sally Norouz
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	5870408	N/A	2018/12/05	Fatemeh Habibagahi
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5870146	2018/12/04	2018/12/04	Mariana Vascan
Soluble Fluoride analysis in Soil	ISE	5876482	2018/12/07	2018/12/07	Neil Dassanayake
Strong Acid Leachable Metals by ICPMS	ICP/MS	5876175	2018/12/07	2018/12/07	Matthew Ritenburg
Moisture	BAL	5870153	N/A	2018/12/05	Mariana Vascan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5871741	2018/12/05	2018/12/06	Lilliana Gaburici
pH CaCl2 EXTRACT	AT	5872357	2018/12/06	2018/12/06	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5869483	N/A	2018/12/10	Automated Statchk



Maxxam Job #: B8W3024  
Report Date: 2018/12/11

DST Consulting Engineers Inc  
Client Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON  
Sampler Initials: AC

## TEST SUMMARY

**Maxxam ID:** ILM391 Dup  
**Sample ID:** 36011-05  
**Matrix:** Soil

**Collected:** 2018/12/03  
**Shipped:**  
**Received:** 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Strong Acid Leachable Metals by ICPMS	ICP/MS	5876175	2018/12/07	2018/12/07	Matthew Ritenburg

**Maxxam ID:** ILM392  
**Sample ID:** 36011-06  
**Matrix:** Soil

**Collected:** 2018/12/03  
**Shipped:**  
**Received:** 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5869700	N/A	2018/12/07	Liliana Gaburici
Hot Water Extractable Boron	ICP	5876185	2018/12/07	2018/12/07	Azita Fazaali
Free (WAD) Cyanide	TECH	5873015	2018/12/05	2018/12/06	Louise Harding
Conductivity	AT	5875742	2018/12/06	2018/12/07	Kazzandra Adeva
Hexavalent Chromium in Soil by IC	IC/SPEC	5872923	2018/12/05	2018/12/10	Sally Norouz
Petroleum Hydro. CCME F1 & BTEX In Soil	HSGC/MSFD	5870408	N/A	2018/12/05	Fatemeh Habibagahi
Petroleum Hydrocarbons F2-F4 In Soil	GC/FID	5870146	2018/12/04	2018/12/04	Mariana Vasan
Soluble Fluoride analysis in Soil	ISE	5876482	2018/12/07	2018/12/07	Neil Dassanayake
Strong Acid Leachable Metals by ICPMS	ICP/MS	5876175	2018/12/07	2018/12/07	Matthew Ritenburg
Moisture	BAL	5870153	N/A	2018/12/05	Mariana Vasan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5871741	2018/12/05	2018/12/05	Liliana Gaburici
pH CaCl2 EXTRACT	AT	5872357	2018/12/06	2018/12/06	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5869483	N/A	2018/12/10	Automated Statchk

**Maxxam ID:** ILM393  
**Sample ID:** 36011-01  
**Matrix:** Soil

**Collected:** 2018/12/03  
**Shipped:**  
**Received:** 2018/12/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5869700	N/A	2018/12/07	Liliana Gaburici
Hot Water Extractable Boron	ICP	5876185	2018/12/07	2018/12/07	Azita Fazaali
Free (WAD) Cyanide	TECH	5873015	2018/12/05	2018/12/06	Louise Harding
Conductivity	AT	5875742	2018/12/06	2018/12/07	Kazzandra Adeva
Hexavalent Chromium in Soil by IC	IC/SPEC	5872923	2018/12/05	2018/12/10	Sally Norouz
Petroleum Hydro. CCME F1 & BTEX In Soil	HSGC/MSFD	5870408	N/A	2018/12/05	Fatemeh Habibagahi
Petroleum Hydrocarbons F2-F4 In Soil	GC/FID	5870146	2018/12/04	2018/12/05	Mariana Vasan
Soluble Fluoride analysis in Soil	ISE	5876482	2018/12/07	2018/12/07	Neil Dassanayake
Strong Acid Leachable Metals by ICPMS	ICP/MS	5876175	2018/12/07	2018/12/07	Matthew Ritenburg
Moisture	BAL	5870153	N/A	2018/12/05	Mariana Vasan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5871741	2018/12/05	2018/12/05	Liliana Gaburici
pH CaCl2 EXTRACT	AT	5872357	2018/12/06	2018/12/06	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5869483	N/A	2018/12/10	Automated Statchk

### GENERAL COMMENTS

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

Package 1	10.0°C
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Sample ILM388 [36011-02] : SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Sample ILM389 [36011-03] : SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Sample ILM391 [36011-05] : SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Sample ILM393 [36011-01] : SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

#### O.REG 153 PAHS (SOIL)

PAH Compounds in Soil by GC/MS (SIM): PAH Analysis: Some parameters were not calculated NC in matrix spike due to high concentration of target analytes in the parent sample.

Results relate only to the items tested.





## QUALITY ASSURANCE REPORT

DST Consulting Engineers Inc  
Client Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON  
Sampler Initials: AC

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5870146	o-Terphenyl	2018/12/04	93	30 - 130	107	30 - 130	101	%		
5870408	1,4-Difluorobenzene	2018/12/04	102	60 - 140	107	60 - 140	101	%		
5870408	4-Bromofluorobenzene	2018/12/04	100	60 - 140	105	60 - 140	99	%		
5870408	D10-Ethylbenzene	2018/12/04	130	30 - 130	130	30 - 130	108	%		
5870408	D4-1,2-Dichloroethane	2018/12/04	99	60 - 140	102	60 - 140	98	%		
5871741	D10-Anthracene	2018/12/05	79	50 - 130	80	50 - 130	78	%		
5871741	D14-Terphenyl (FS)	2018/12/05	88	50 - 130	78	50 - 130	71	%		
5871741	D8-Acenaphthylene	2018/12/05	106	50 - 130	98	50 - 130	95	%		
5870146	F2 (C10-C16 Hydrocarbons)	2018/12/05	83	50 - 130	93	80 - 120	<10	ug/g	NC	50
5870146	F3 (C16-C34 Hydrocarbons)	2018/12/05	83	50 - 130	93	80 - 120	<50	ug/g	8.8	50
5870146	F4 (C34-C50 Hydrocarbons)	2018/12/05	83	50 - 130	93	80 - 120	<50	ug/g	17	50
5870153	Moisture	2018/12/05							36	50
5870408	Benzene	2018/12/05	68	60 - 140	84	60 - 140	<0.0050	ug/g	NC	50
5870408	Ethylbenzene	2018/12/05	77	60 - 140	81	60 - 140	<0.010	ug/g	NC	50
5870408	F1 (C6-C10) - BTEX	2018/12/05					<10	ug/g	NC	50
5870408	F1 (C6-C10)	2018/12/05	75	60 - 140	99	80 - 120	<10	ug/g	NC	50
5870408	o-Xylene	2018/12/05	70	60 - 140	82	60 - 140	<0.020	ug/g	NC	50
5870408	p+m-Xylene	2018/12/05	75	60 - 140	82	60 - 140	<0.040	ug/g	NC	50
5870408	Toluene	2018/12/05	72	60 - 140	80	60 - 140	<0.020	ug/g	NC	50
5870408	Total Xylenes	2018/12/05					<0.040	ug/g	NC	50
5871741	1-Methylnaphthalene	2018/12/05	75	50 - 130	76	50 - 130	<0.0050	ug/g	NC	40
5871741	2-Methylnaphthalene	2018/12/05	74	50 - 130	82	50 - 130	<0.0050	ug/g	NC	40
5871741	Acenaphthene	2018/12/05	84	50 - 130	76	50 - 130	<0.0050	ug/g	NC	40
5871741	Acenaphthylene	2018/12/05	64	50 - 130	99	50 - 130	<0.0050	ug/g	4.2	40
5871741	Anthracene	2018/12/05	NC	50 - 130	71	50 - 130	<0.0050	ug/g	NC	40
5871741	Benzo(a)anthracene	2018/12/05	NC	50 - 130	68	50 - 130	<0.0050	ug/g	18	40
5871741	Benzo(a)pyrene	2018/12/05	NC	50 - 130	79	50 - 130	<0.0050	ug/g	24	40
5871741	Benzo(b,j)fluoranthene	2018/12/05	NC	50 - 130	69	50 - 130	<0.0050	ug/g	16	40
5871741	Benzo(g,h,i)perylene	2018/12/05	NC	50 - 130	98	50 - 130	<0.0050	ug/g	15	40
5871741	Benzo(k)fluoranthene	2018/12/05	NC	50 - 130	67	50 - 130	<0.0050	ug/g	17	40
5871741	Chrysene	2018/12/05	NC	50 - 130	87	50 - 130	<0.0050	ug/g	21	40
5871741	Dibenz(a,h)anthracene	2018/12/05	NC	50 - 130	79	50 - 130	<0.0050	ug/g	13	40



## QUALITY ASSURANCE REPORT(CONT'D)

DST Consulting Engineers Inc  
Client Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON  
Sampler Initials: AC

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5871741	Fluoranthene	2018/12/05	NC	50 - 130	74	50 - 130	<0.0050	ug/g	31	40
5871741	Fluorene	2018/12/05	88	50 - 130	90	50 - 130	<0.0050	ug/g	NC	40
5871741	Indeno(1,2,3-cd)pyrene	2018/12/05	NC	50 - 130	91	50 - 130	<0.0050	ug/g	24	40
5871741	Naphthalene	2018/12/05	67	50 - 130	68	50 - 130	<0.0050	ug/g	NC	40
5871741	Phenanthrene	2018/12/05	NC	50 - 130	66	50 - 130	<0.0050	ug/g	30	40
5871741	Pyrene	2018/12/05	NC	50 - 130	73	50 - 130	<0.0050	ug/g	29	40
5872357	Available (CaCl2) pH	2018/12/06			100	97 - 103			0.41	N/A
5872923	Chromium (VI)	2018/12/10	86	70 - 130	89	80 - 120	<0.2	ug/g	NC	35
5873015	WAD Cyanide (Free)	2018/12/06	94	75 - 125	98	80 - 120	<0.01	ug/g	NC	35
5875742	Conductivity	2018/12/07			104	90 - 110	<0.002	mS/cm	0.46	10
5876175	Acid Extractable Antimony (Sb)	2018/12/07	100	75 - 125	103	80 - 120	<0.20	ug/g	2.9	30
5876175	Acid Extractable Arsenic (As)	2018/12/07	102	75 - 125	103	80 - 120	<1.0	ug/g	7.9	30
5876175	Acid Extractable Barium (Ba)	2018/12/07	NC	75 - 125	97	80 - 120	<0.50	ug/g	1.8	30
5876175	Acid Extractable Beryllium (Be)	2018/12/07	107	75 - 125	101	80 - 120	<0.20	ug/g	3.7	30
5876175	Acid Extractable Boron (B)	2018/12/07	100	75 - 125	101	80 - 120	<5.0	ug/g	7.7	30
5876175	Acid Extractable Cadmium (Cd)	2018/12/07	103	75 - 125	99	80 - 120	<0.10	ug/g	8.1	30
5876175	Acid Extractable Chromium (Cr)	2018/12/07	105	75 - 125	103	80 - 120	<1.0	ug/g	5.2	30
5876175	Acid Extractable Cobalt (Co)	2018/12/07	104	75 - 125	101	80 - 120	<0.10	ug/g	0.39	30
5876175	Acid Extractable Copper (Cu)	2018/12/07	NC	75 - 125	101	80 - 120	<0.50	ug/g	4.3	30
5876175	Acid Extractable Lead (Pb)	2018/12/07	NC	75 - 125	104	80 - 120	<1.0	ug/g	1.2	30
5876175	Acid Extractable Mercury (Hg)	2018/12/07	95	75 - 125	90	80 - 120	<0.050	ug/g	17	30
5876175	Acid Extractable Molybdenum (Mo)	2018/12/07	105	75 - 125	102	80 - 120	<0.50	ug/g	17	30
5876175	Acid Extractable Nickel (Ni)	2018/12/07	103	75 - 125	105	80 - 120	<0.50	ug/g	2.4	30
5876175	Acid Extractable Selenium (Se)	2018/12/07	105	75 - 125	104	80 - 120	<0.50	ug/g	NC	30
5876175	Acid Extractable Silver (Ag)	2018/12/07	105	75 - 125	102	80 - 120	<0.20	ug/g	NC	30
5876175	Acid Extractable Thallium (Tl)	2018/12/07	103	75 - 125	103	80 - 120	<0.050	ug/g	12	30
5876175	Acid Extractable Tin (Sn)	2018/12/07	107	75 - 125	104	80 - 120	<1.0	ug/g	NC	30
5876175	Acid Extractable Uranium (U)	2018/12/07	99	75 - 125	97	80 - 120	<0.050	ug/g	3.3	30
5876175	Acid Extractable Vanadium (V)	2018/12/07	NC	75 - 125	101	80 - 120	<5.0	ug/g	4.9	30
5876175	Acid Extractable Zinc (Zn)	2018/12/07	NC	75 - 125	101	80 - 120	<5.0	ug/g	2.2	30
5876185	Hot Water Ext. Boron (B)	2018/12/07	108	75 - 125	107	75 - 125	<0.050	ug/g	1.7	40
5876437	Hot Water Ext. Boron (B)	2018/12/07	99	75 - 125	100	75 - 125	<0.050	ug/g	NC	40

## QUALITY ASSURANCE REPORT(CONT'D)

DST Consulting Engineers Inc  
Client Project #: GV-SO-036011  
Site Location: REMIC RAPIDS, OTTAWA, ON  
Sampler Initials: AC

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5876470	Conductivity	2018/12/07			105	90 - 110	<0.002	mS/cm	1.1	10
5876482	Fluoride (F-)	2018/12/07	84	80 - 120	96	80 - 120	<5	ug/g	NC	25

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.

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 spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 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 (absolute difference <= 2x RDL).

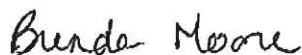


### VALIDATION SIGNATURE PAGE

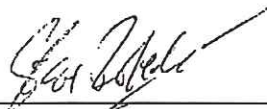
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Anastassia Hamanov, Scientific Specialist



Brenda Moore, Team Lead, Inorganic



Steve Roberts, Ottawa Lab Manager

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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.

## **ATTACHMENT D**

### Limitations of Report

### **Limitations of Report**

The information, conclusions and recommendations given herein are specifically for this project and this Client (NCC) only, and for the scope of work described herein. It may not be sufficient for other uses. DST does not accept responsibility for use by third parties.

The data, conclusions and recommendations which are presented in this report, and the quality thereof, are based on a scope of work authorized by the Client. Note, however, that no scope of work, no matter how exhaustive, can identify all contaminants or all conditions above and below ground. For example, conditions between test holes may differ from those encountered in the investigation and observed or measured conditions may change with time. This report therefore cannot warranty that all conditions on or off the site are represented by those identified at specific locations.

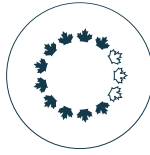
Any recommendations and conclusions provided that are based on conditions or assumptions reported herein will inherently include any uncertainty associated with those conditions or assumptions. In fact many aspects involving professional judgement such as subsurface models and remediation criteria contain a degree of uncertainty which cannot be eliminated. This uncertainty should be managed by periodic review and refinement as additional information becomes available.

Note also that standards, guidelines and practices related to environmental investigations may change with time. Those which were applied at the time of this investigation may be obsolete or unacceptable at a later date.

Any topographic benchmarks and elevations documented in this report are primarily to establish relative elevation differences between test locations and should not be used for other purposes such as grading, excavation, planning, development, etc.

Any comments given in this report on potential remediation problems and possible methods are intended only for the guidance of the designer. The scope of work may not be sufficient to determine all of the factors that may affect construction or clean-up methods and costs. Contractors bidding on this project or undertaking clean-ups should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the conditions may affect their work.

Any results from an analytical laboratory, title searcher or other subcontractor reported herein have been carried out by others, and DST cannot warranty their accuracy. Similarly, DST cannot warranty the accuracy of information supplied by the Client.



NATIONAL CAPITAL COMMISSION  
COMMISSION DE LA CAPITALE NATIONALE

## INFORMATION SHEETS

# Common Buckthorn

(*Rhamnus cathartica*)

Common buckthorn (also known as European buckthorn) is a small shrub or tree native to Eurasia. It was introduced to North America in the 1880s as an ornamental shrub and was widely planted for fencerows and windbreaks in agricultural fields. Since then it has spread aggressively throughout southern Ontario and in other provinces.

Common buckthorn can thrive in a wide range of soil and light conditions, enabling it to invade a variety of habitats. It is most often found in woodlands and open fields, where it forms dense stands under which few other plants can grow. Buckthorn can spread widely with the help of birds and animals that eat its fruit, carry the seeds long distances and deposit them in their droppings. Stands of buckthorn can invade roadsides, riverbanks, mature forests, farm fields and hydro corridors.



Common buckthorn leaves and flowers.  
Photo: Credit Valley Conservation Area

## Range

Outside its native range, common buckthorn is found in Canada as far west as Saskatchewan and as far east as Nova Scotia. It also grows throughout the northeastern and north central United States.

## Impacts of Common Buckthorn

- Buckthorn thrives in a variety of habitats and forms dense thickets that crowd and shade out native plants. It can alter nitrogen levels in the soil, creating better conditions for its own growth and discouraging the growth of native species.
- It produces large numbers of seeds that germinate quickly and prevent the natural growth of native trees and shrubs.
- The shrub can host oat rust, a fungus that causes leaf and crown rust and affects the yield and quality of oats.
- The soybean aphid, an insect that damages soybean crops, can use buckthorn as a host plant to survive the winter.



Common buckthorn, showing typical deep green foliage in fall, dominates the lower layers of forests. Photo: Wasyl Bakowsky, MNR

Because it can affect agricultural crops, common buckthorn is listed as a noxious weed under Ontario's Weed Control Act.



## How to Identify Common Buckthorn

- Buckthorn is usually the first shrub to leaf out in the spring and the last to drop its leaves late in the fall.
- It often grows two to three metres tall. Occasionally it reaches six metres, with a trunk up to 25 centimetres in diameter.
- Smooth, dark green leaves are finely toothed, 2.5 to six centimetres long, and arranged in opposing pairs along the stem.
- Most branches older than one year end in a short, sharp thorn.
- Flowers have two to six small yellowish-to-green petals.
- Common buckthorn produces clusters of berry-like black fruit in late summer and fall.

Common buckthorn resembles another invasive species, glossy buckthorn (*Frangula alnus*), and a much smaller native shrub, alder-leaved buckthorn (*Rhamnus alnifolia*).

Check the chart below to identify common buckthorn, glossy buckthorn and alder-leaved buckthorn.

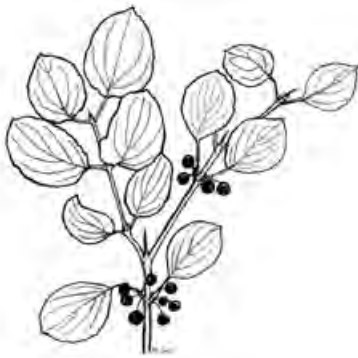


Illustration by Andrea Kingsley



Illustration by Andrea Kingsley



Illustration by Andrea Kingsley

### Common buckthorn

(*Rhamnus cathartica*) (invasive)

- Grows in drier areas
- Often two to three metres tall; can reach six metres
- Twigs end in sharp thorn
- Usually opposite leaves with finely toothed edges

### Glossy buckthorn

(*Frangula alnus*) (invasive)

- Grows in wet areas
- Often two to three metres tall; can reach six metres
- No sharp thorn on end of twig
- Alternate, shiny leaves with smooth, wavy edges

### Alder-leaved buckthorn

(*Rhamnus alnifolia*) (native)

- Grows in very wet areas
- Up to one metre tall
- No sharp thorn on end of twig
- Alternate, shiny leaves with toothed edges
- Small growths (stipules) at base of leaves

## What You Can Do

- Learn how to identify common buckthorn, glossy buckthorn and other invasive plants, and how to effectively manage these species on your property. See *The Landowner's Guide to Controlling Invasive Woodland Plants*. Go to [ontario.ca/invasivespecies](http://ontario.ca/invasivespecies), click on **Here's a list of things you can do to help fight invasive species**, and click on the title.
- Avoid using invasive plants in gardens and landscaping.
- Buy native or non-invasive plants from reputable garden suppliers. Native plants provide habitat and food sources for native wildlife. See *Grow Me Instead: Beautiful Non-Invasive Plants for Your Garden*. Go to [ontario.ca/invasivespecies](http://ontario.ca/invasivespecies), click on **Here's a list of things you can do to help fight invasive species**, and click on the title.
- Dispose of invasive plants in the garbage. Do not put them in the compost or discard them in natural areas. Discarded flowers may produce seeds.
- When hiking, prevent the spread of invasive plants by staying on trails and keeping pets on a leash.
- If you've seen common buckthorn or other invasive species in the wild, please contact the Invading Species Hotline at 1-800-563-7711, or visit [www.invadingspecies.com](http://www.invadingspecies.com) to report a sighting.

## Other Resources:

[www.invasivespeciescentre.ca](http://www.invasivespeciescentre.ca)  
[ontario.ca/invasivespecies](http://ontario.ca/invasivespecies)  
[www.ontarioinvasiveplants.ca](http://www.ontarioinvasiveplants.ca)  
[www.invadingspecies.com](http://www.invadingspecies.com)

## For More Information:

Please contact the Invading Species Hotline at 1-800-563-7711.

Photo: Greg Bales, MNR



Common buckthorn  
ripe fruit cluster.

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Cette publication est également disponible en français.

# Poison Ivy Fact Sheet

Poison ivy grows in woods, fields and along roadsides and riverbeds. It can be a high-climbing woody vine, a small low-growing shrub or ground cover. Poison ivy grows in every region of the United States except the Southwest, Hawaii and Alaska.



## ***Distinguishing Characteristics – “Leaves of three let them be”***

- Three thin, pointy and shiny leaves; however, the shape, texture and color of leaves can vary.
- Leaves are reddish in spring, green in summer and orange, red or bronze in the fall.

Jennifer Anderson @ USDA-NRCS PLANTS Databasepdf'd

## ***Toxicity***

- Most people are sensitive to the oily resin or sap of poison ivy (urushiol). Urushiol is found year round in all parts of the plant including the roots, stems, flowers and leaves.
- Animals are not sensitive to poison ivy, but people can get poison ivy from an animal's hair or fur.

## ***Potential Exposures***

- Exposures are more common in the spring and summer.
- A person can get a rash by touching any part of the poison ivy plant or anything that has come in contact with poison ivy and still has the oily resin on it. Examples include sporting or camping equipment, gardening tools, shoes, clothes and pets or contaminated surfaces.
- Contact with fluid-filled blisters that develop does not spread poison ivy.
- Smoke from burning poison ivy can cause irritation to the eyes, skin, nose and throat and difficulty breathing. This irritation can sometimes be severe.

## ***Symptoms***



- A rash may develop between 1 hour and 5 days after contact. The rash can vary in severity and usually starts with itching, redness and swelling sometimes followed by tiny pimples or blisters.
- Delayed symptoms may appear if skin comes in contact with contaminated items or surfaces.

## ***Treatment***

- Immediately after exposure (within 10-15 minutes) wash exposed areas, including nails, with cool water and soap.
- Wash contaminated surfaces with rubbing alcohol and clothes and shoes with hot water and soap.
- See your health care provider if symptoms are severe or persist and for treatment advice.
- If you experience difficulty breathing, swelling in the throat, dizziness or weakness call 911.

## ***Prevention***

- Learn to recognize poison ivy and avoid exposure.
- Always wear vinyl gloves when removing plants (urushiol can penetrate rubber).
- Wear long pants, long sleeves, socks, closed shoes, hat when walking in areas with poison ivy.
- Do not burn poison ivy.

**Contact the Northern New England Poison Center for information or questions at 1-800-222-1222 or visit [www.nnepc.org](http://www.nnepc.org).**

# Stinging Nettle Safety

Stinging nettle has fine hairs on the leaves and stems that contain irritating chemicals, which are released when the plant comes in contact with the skin. The hairs, or spines, of the stinging nettle are normally very painful to the touch.

**Precaution: Avoid this plant to avoid getting stung!**

## Reaction/Response:

- Reddening and intense itching of short duration
- Sensitive individuals may experience swelling and burning
- Wash affected area or immediately apply a baking soda paste to soothe stinging sensation
- A prolonged tingling sensation may persist on the affected skin for more than 12 hours, even after visible symptoms have faded.

## Leaves:

- Fine toothed, tapered, ~3-15 cm heart-shaped leaves
- Thin catkins of tiny green flowers grow from the leaf stems

**Height:** Generally 1 metre but can grow up to 2 metres depending on location and soil condition.

## Habitat:

- Generally in the same locations every year.
- Thrive in rich soil, moist woodlands, thickets, disturbed areas, along partially shaded trails and riversides
- Blooms between June and September.

## Control:

- Remove plants by hand -- wear gloves to protect skin from the stinging hairs
- Ensure the underground portion (rhizomes) are removed or the plants will regrow
- Close mowing can prevent the development of fruit
- Be aware cultivating the soil may spread the rhizomes, thus increasing the size of the population
- Repeated cultivation works best as a control for this weed



Fact sheet distributed by Occupational Health Clinics for Ontario Workers (OHCOW). 1-877-817-0336 [www.ohcow.on.ca](http://www.ohcow.on.ca)

**Sources:** Stinging nettle | University of Maryland Medical Center <http://umm.edu/health/medical/altmed/herb/stinging-nettle#ixzz3Uwiz4rys>. University of Maryland Medical Center <http://www.ediblewildfood.com/stinging-nettle.aspx>

Stinging Nettles of Florida0 IFAS Extension –University of Florida-Wendy B. Zomlefer

Burning & Stinging Nettles Statewide Integrated Pest Management Program-University of California Agriculture Natural Resources.



# Tick Safety in the Greenbelt

## What are ticks?

Closely related to spiders, ticks are a group of about 900 species of parasites in the class Arachnida. These small animals rely on the blood of host animals such as deer, hare, and mice to live. Ticks attach to animals by waiting on shrubs and grasses until an appropriate host brushes by, then finding a good location to cut into the host and feed on the host's blood. In the Capital Region, the blacklegged tick, or deer tick (*Ixodes scapularis*), is the main concern, due to the potential for it to transmit Lyme disease.



## Why should you be concerned?

Ticks are a vector of various diseases. Susceptible hosts can become infected while ticks are feeding. Lyme disease, caused by bacterial infection spread by the blacklegged tick, is an illness that, left untreated, can cause severe symptoms such as nervous system disorders, mental issues, and paralysis.



## What can you do to reduce the risk?

When walking in tick habitat (shrubby and brushy areas where host animals such as deer and mice can be found), simple measures can help to reduce the risk of getting bitten:

- Apply insect repellent.
- Wear long-sleeved shirts and long pants.
- Tuck pant legs into socks.

After any activity in tick habitat, a thorough check for ticks is always a good idea.

## What to do if you are bitten by a tick?

If you are bitten by a tick, the best course of action is to remove the tick as soon as possible, since Lyme disease will usually manifest only from infected ticks that have been attached for more than 24 hours. This is done by grasping the tick with tweezers or a tick remover as close to your skin as possible, and gently pulling it straight out. After the tick is removed, disinfect or wash the area well with soap and water.

For more information about ticks and Lyme disease, including signs and symptoms, please visit:



# West Nile virus



Anyone bitten by a mosquito carrying the West Nile virus can experience symptoms that range from nothing at all to high fever, tremors, muscle weakness and more.

Learn how to protect yourself and reduce your risk of getting West Nile.

## How you get West Nile virus

West Nile virus is carried by mosquitoes. The mosquitoes become infected by feeding on an infected bird. If an infected mosquito bites you, it will pass the disease onto you. Everyone in Ontario who spends time near infected mosquitos could get West Nile.

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## Symptoms

Four out of five people do not show any symptoms. Others see symptoms 2-15 days after being bitten by an infected mosquito.

Common symptoms include:

- fever
- headache
- body ache
- nausea
- vomiting
- rash on chest, stomach or back

Approximately one in 150 people will have serious symptoms including:

- high fever
- severe headache
- muscle weakness
- stiff neck
- confusion
- tremors
- numbness
- sudden sensitivity to light

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## How to avoid West Nile virus

### Cover up

Cover up when going outside between the hours of dusk and dawn (when most mosquitoes feed). Remember to wear:

- a long-sleeved shirt or jacket and long pants (tucked into your socks for extra protection)
- light-coloured clothing
- if you will be outside for a long time, wear special clothing that is designed to protect you from bugs

### Clean up

- once a week, get rid of standing water around your home (mosquitoes lay their eggs in stagnant water, even small amounts)
- keep bushes and shrubs clear of overgrowth and debris (adult mosquitoes like to rest in dense shrubbery)
- turn your compost pile often

### Use insect repellent

- use a bug repellent containing DEET or icaridin
- always read and follow all the label directions when using any insect repellent or ask a pharmacist for help when choosing an insect repellent product

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## If you think you have West Nile virus

If you think you've contracted the West Nile virus, contact:

- your doctor or other health care provider
- your local public health unit (PHU)
- Telehealth Ontario – a free service which uses registered nurses to answer your health concerns around the clock
  - toll free 1-866-797-0000
  - TTY 1-866-797-0007



# Wild Parsnip

(*Pastinaca sativa*)

Wild parsnip is an invasive plant native to Europe and Asia. It was likely brought to North America by European settlers, who grew it for its edible root. Since its introduction, wild parsnip has escaped from cultivated gardens and spread across the continent.

Wild parsnip roots are edible, but the sap of the plant can cause severe burns. Collecting the plant from the wild should only be done with extreme care. See the section Protective Clothing below.

Wild parsnip, which is also known as poison parsnip, is a member of the carrot/parsley family. It typically grows a low, spindly rosette of leaves in the first year while the root develops. In the second year it flowers on a tall stalk and then dies. The plant can form dense stands and spreads quickly in disturbed areas such as abandoned yards, waste dumps, meadows, open fields, roadsides and railway embankments. Its seeds are easily dispersed by wind and water, and on mowing or other equipment.

Like giant hogweed and other members of the carrot family, it produces sap containing chemicals that can cause human skin to react to sunlight, resulting in intense burns, rashes or blisters.

## Range

In North America, scattered wild parsnip populations are found from British Columbia to California, and from Ontario to Florida. It has been reported in all provinces and territories of Canada except Nunavut. The plant is currently found throughout eastern and southern Ontario, and researchers believe it is spreading from east to west across the province.



Flowers grow in yellowish-green clusters

Photo: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

## Impacts of Wild Parsnip

- The plant can form dense stands that outcompete native plants, reducing biodiversity.
- Stem, leaves, and flowers contain chemicals that can increase skin sensitivity to sunlight and cause severe dermatitis.
- Wild parsnip reduces the quality and saleability of agricultural forage crops such as hay, oats, and alfalfa.
- Chemical compounds in the plant are known to reduce weight gain and fertility in livestock that eat it.

## How to Identify Wild Parsnip

- Grows up to 1.5 metres tall.
- The single green stem is two to five centimetres thick and smooth with few hairs.
- Compound leaves are arranged in pairs, with sharply toothed leaflets that are shaped like a mitten.

- Yellowish green flowers form umbrella-shaped clusters 10 to 20 centimetres across.
- Seeds are flat and round.

Check the chart below to know how to identify wild parsnip.



**Giant Hogweed**  
(*Heracleum mantegazzianum*)

**Cow Parsnip**  
(*Heracleum maximum*)

**Wild Parsnip**  
(*Pastinaca sativa*)

**Queen Anne's Lace**  
(*Daucus carota*)

**Angelica**  
*Angelica* spp.

	Giant Hogweed ( <i>Heracleum mantegazzianum</i> )	Cow Parsnip ( <i>Heracleum maximum</i> )	Wild Parsnip ( <i>Pastinaca sativa</i> )	Queen Anne's Lace ( <i>Daucus carota</i> )	Angelica <i>Angelica</i> spp.
<b>Height</b>	2.5 to 5 m	1 to 2.5 m	0.5 to 1.5 m	0.3 to 1.5 m	1.2 to 2.1 m
<b>Flowers</b>	Large, white umbrella-shaped flower clusters 30 to 90 cm across, made up of 50 to 150 small flower clusters	White umbrella-shaped flower cluster 10 to 30 cm across, made up of 15 to 30 small clusters	Yellowish-green flower clusters 10 to 20 cm across	White flower cluster 5 to 10 cm across. Pale pink before fully opened. Often single purple flower in centre of flower cluster	Greenish-white globe-like flower clusters 8 to 25 cm across
<b>Leaves</b>	Prominently spiked edges Up to 1.5 m long Leaflets grow right out of each side of main stem, with no leaf stalk	Leaves have lobes shaped like a hand with fingers, with fuzzy undersides Up to 0.5 m long and wide Leaf blade separated from main stem by leaf stalk	Leaves consist of 2 to 5 pairs of leaflets that grow across from each other along the stem, and one diamond-shaped leaflet on the end Leaflets toothed and often shaped like a mitten	Leaves are staggered along the stem (alternate) Leaves consist of leaflets that are finely divided into narrow segments. Each segment of the lower leaves is further divided into fine lobes, resulting in a feathery appearance	Alternate leaves, divided into 2 to 3 leaflets
<b>Stem</b>	Hollow, 5 to 15 cm thick Prominent purple blotches Distinct, coarse, bristly hairs	Hollow, 5 cm thick at base Green, few to no purple spots Soft and fuzzy hairs	Green, 2.5 to 5 cm thick Smooth with few hairs	Green, 1 to 2.5 cm thick Covered with fine bristly hairs	Purple or purple blotched Smooth (no hairs)
<b>Lifecycle</b>	Biennial (lives for 2 years) or perennial (lives longer than 2 years)	Perennial	Biennial/Perennial	Biennial	Perennial
<b>Origin</b>	Invasive	Native	Invasive	Invasive	Native

## Wild Parsnip Removal and Management

If you have small clusters of wild parsnip on your property (fewer than 100 plants), you may be able to manage the plant yourself. Wear protective clothing and dispose of plants carefully, as described below. To remove larger infestations (thousands of plants), you will likely need a professional exterminator and repeated treatments over several years.

**Note:** To manage wild parsnip effectively, learn how to identify the plant in both its first-year stage as a small rosette of leaves, and in its second year, as a tall flowering plant. The area must be monitored for several seasons to ensure complete eradication.

### Protective Clothing

Wear protective clothing, including waterproof gloves, long-sleeved shirts, pants and eye protection. A disposable spray suit over your normal clothing provides the best protection. Spray suits are commercial-grade waterproof coveralls. After working around the plant, remove your protective clothing carefully to avoid transferring any sap from your clothing onto your skin. Wash your rubber gloves with soap and water, then take off your spray suit or outer clothing. Wash your rubber gloves again and then take them off. Finally, take off your protective eye wear. Put non-disposable clothing in the laundry and wash yourself immediately with soap and water.

### Mechanical Control

For a small infestation in a yard or garden (fewer than 100 plants), dig out as much of the taproot as you can with a sharp shovel or spade. Digging is most effective in the spring when the soil is moist and the taproot is more easily removed. Follow-up digging will be required every few weeks to deal with re-growth (if the taproot was not completely removed) or missed plants.

Pulling up the plants is impractical for larger infestations, but mowing can be effective if begun just after peak blooming, but before the seeds set in the late summer or early fall. Cut plants will likely re-sprout after mowing, so it is important to combine mowing with other control methods.

Another method of control is to cover the dug or mowed areas with black plastic to smother new growth of all plants. The plastic should be left in place for at least one season to ensure the roots are smothered. The area must be replanted after the plastic is removed to replace desirable plants and rehabilitate the soil.

### Chemical Control

In Ontario, herbicide use, storage and disposal is regulated under the Pesticides Act. While many uses of herbicides are banned, certain herbicides may be used to control plants that are poisonous to humans who touch them, such as wild parsnip. Herbicides that may be used for this purpose include those containing the active ingredient glyphosate. If you are considering using a pesticide, read the product label before buying it to ensure it can legally be used on wild parsnip.

Herbicides containing glyphosate can be an effective tool to control larger populations of wild parsnip. Glyphosate is a broad spectrum herbicide that kills green plants that it comes into contact with. New seedlings will often germinate and emerge after glyphosate has been applied, meaning that follow up applications may be required.

For the best results, apply herbicide to the leaves of actively growing plants in the spring, followed by a summer application for missed plants that are still growing. Herbicide treatments may need to be repeated in following years. Follow directions on the product label and provincial and federal laws when using herbicides.

### Disposal

DO NOT burn or compost wild parsnip plants that have been cut down or dug up. If possible, leave the stems to dry out completely at the site. Carefully dispose of plant material in black plastic bags and leave in direct sun for a week or more. Contact your municipality to determine if the bagged plants can be sent to your local landfill site.



## What You Can Do

- Learn how to identify wild parsnip and other invasive plants.
- Stay on trails and away from areas known to have wild parsnip or other invasive species.
- Inspect, clean and remove mud, seeds and plant parts from clothing, pets (including horses), vehicles (including bicycles) and equipment such as mowers and tools. Before travelling to new areas, clean vehicles and equipment in a place where plant seeds or parts aren't likely to spread, such as in a driveway or at a car wash. It's very important to carefully wash any sap from clothing, equipment and pets.
- Avoid disturbing soil and removing plants from natural areas; they may be rare native plants or even invasive plants.



Compound leaves are arranged in pairs

Photo: Ohio State Weed Lab Archive, The Ohio State University, Bugwood.org



Wild Parsnip

Photo: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

- If you think you have wild parsnip on your property or if you see it in your community, please call the Invading Species Hotline at 1-800-563-7711, or report your sighting online at [www.invadingspecies.com](http://www.invadingspecies.com). You will be asked to send in photos for identification. **DO NOT** touch, cut or collect parts of the plant for identification purposes.



Yellowish-green flowers turn into round, flat brown seeds

Photo: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

## Other Resources:

[www.invasivespeciescentre.ca](http://www.invasivespeciescentre.ca)

[ontario.ca/invasivespecies](http://ontario.ca/invasivespecies)

[www.ontarioinvasiveplants.ca](http://www.ontarioinvasiveplants.ca)

[www.invadingspecies.com](http://www.invadingspecies.com)

Ministry of the Environment pesticides information for homeowners

[www.ene.gov.on.ca/environment/en/category/pesticides/STDPROD\\_085338.html#1](http://www.ene.gov.on.ca/environment/en/category/pesticides/STDPROD_085338.html#1)

Ministry of the Environment fact sheet Managing Pests in Lawns and Gardens

[www.ene.gov.on.ca/environment/en/resources/STD01\\_076153.html](http://www.ene.gov.on.ca/environment/en/resources/STD01_076153.html)

## For More Information:

Please contact the Invading Species Hotline at 1-800-563-7711.

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# Giant Hogweed

(*Heracleum mantegazzianum*)



Photo courtesy of Patrick Hodge, MNR

## Similar Species

There are a number of plants that look very similar to Giant hogweed such as Cow parsnip, Purplestem angelica, Woodland angelica, Valerian, Lovage, and Queen Anne's-Lace (also known as Wild carrot). However, these plants are not as large as a mature Giant hogweed, which grows up to 5.5 metres tall under ideal conditions. The white flower clusters resemble those of Queen Anne's-Lace, but tend to be more widely spaced and can form a flower-head almost one metre wide.

## Distribution

Giant hogweed has a scattered distribution across southern and central Ontario, south of the line from Manitoulin Island to Ottawa.

Giant hogweed (*Heracleum mantegazzianum*), also known as Giant cow parsnip is a perennial plant and a member of the carrot family. It is a garden ornamental from southwest Asia that is naturalizing in North America and becoming more common in southern and central Ontario. Giant hogweed has the potential to spread readily and grows along roadsides, ditches and streams. It invades old fields and native habitats such as open woodlands.



Giant hogweed stem. Note coarse hairs.  
Photo courtesy of Ron Black, MNR





Giant hogweed stalk and flower clusters.  
Photo courtesy of Karen Rimmer

## Biology

Seeds may take several years to germinate and are viable in the soil for up to 15 years. During the first year, the plant produces a rosette of leaves up to one metre high. After 2 to 5 years the plant produces flowers. As it grows a large root, thick hollow stems and large lobed leaves are formed. The stems of the plant are covered with reddish-purple flecks and stiff hairs filled with sap. Sap may also collect in the hollow stem bases. Giant hogweed flowers once in its lifetime, unless the flower clusters are damaged before opening. Once the plant produces seeds it dies. Each plant can produce up to 120,000 winged seeds (typically 50,000). Seeds dropped in streams can float for three days. They can move long distances via water in ditches and streams. Seeds can also be spread up to 10 metres by the wind.

## Natural Resource Impacts

There is evidence that Giant hogweed can shade out native plants, although scientists have not done extensive research on its impact in Ontario or Canada. In the United Kingdom it grows in areas bordering lakes, streams, and wetlands and causes rocks, soil and other material on stream banks to fall into streams. This threatens salmon spawning sites. Similar impacts may occur in Ontario.

## Health Concerns

The clear watery sap of Giant hogweed contains toxins that can cause severe dermatitis (inflammation of the skin). You can get severe burns if you get the sap on your skin and the skin is then exposed to sunlight. Symptoms occur within 48 hours and consist of painful blisters. Purplish scars may form that last for many years. Eye contact with the sap has been reported (in the media and by various web sites) to cause temporary or permanent blindness. However, evidence of permanent blindness linked to exposure to Giant hogweed cannot be substantiated by any existing research. Coming in contact with Cow parsnip and Wild parsnip can cause similar reactions.

## Prevention

Do not purchase, trade or grow Giant hogweed in your garden. Only buy native or non-invasive garden plants. When you transport soil, sand or gravel make sure it is free of Giant hogweed – both plant parts and seeds.

## Removal and Management

If you have Giant hogweed on your property, it is recommended that you hire a professional exterminator to remove it. The plant will be removed safely and as few seeds as possible will be spread. Reducing a large population of Giant hogweed will take a long term commitment. The best time to remove the plant is in late April or early May. It is usually less than 30 centimetres tall, easier to dig up, and more susceptible to herbicides at this time of year. It is also cooler in the spring than in the summer so wearing protective clothing is more comfortable.

**Protective clothing:** Wear protective clothing, including waterproof gloves, long sleeve shirts, pants, and eye protection. It is ideal to wear a disposable “spray suit” coverall over top of your normal clothing (spray suits are commercial grade waterproof coveralls). Remove protective clothing carefully to avoid transferring any sap from your clothing onto your skin. Wash your rubber gloves with soap and water, and then take off your spray suit or outer clothing. Wash your rubber gloves again and then take them off. Finally, take off your protective eye wear. Put non-disposable clothing in the laundry and wash yourself immediately with soap and water.

### Mechanical control:

#### **Spring Removal (i.e. early May):**

Use a spade to remove as much of the root as possible. Digging up older plants can be difficult since roots can grow deeper than one metre. The plant might re-grow from the root and you may need to dig repeatedly to remove it completely. Or, you can cover the dug area with black plastic to smother out new growth. If it's possible to use machinery, mow new growth every two weeks.

#### **Summer Removal (i.e. early July):**

- *Plants without flowers:* If the infestation is small dig the stems and roots out and dry them thoroughly before disposing of them.
- *Plants with flowers:* To prevent seeds from growing and spreading, remove flower heads before they ripen (when they are white). **Note: If the flower heads have changed from white to green, seeds are being produced and it will be very hard to remove the seed heads and/or cut the plant without spreading the seeds.** Return to the area regularly and remove any new growth.



Giant hogweed stalk and flower clusters.  
Photo courtesy of Karen Rimmer.

### **Control Using Herbicides:**

Herbicides can be used to control plants (like Giant hogweed) that are poisonous to the touch. Glyphosate is effective at controlling the top-growth of Giant hogweed. Foliar herbicide applications are most effective in spring on actively growing plants, followed with a subsequent summer application for missed plants or plants that have re-grown. Since glyphosate is non-selective and removes only the green vegetation that it comes into contact with, new seedlings will often germinate and emerge after glyphosate has been applied. If areas treated with glyphosate are covered in mulch 10 to 14 days after application, it will reduce seedling germination and growth. Herbicide treatments may need to be repeated in following years. If a plant is flowering, herbicides are not effective and control methods should focus on carefully removing the flower heads. Follow label directions and relevant provincial and federal legislation when using herbicides.

### **Disposal:**

**Do Not Burn. Do Not Compost.** Carefully remove flower heads from stems and place them in black plastic bags. Make sure not to drop any seeds while you are doing this. Seal the bags tightly and leave them in direct sunlight for about a week. Allow stems and roots to dry out thoroughly before disposing of them. Call your municipality to find out if bags containing Giant hogweed can be sent to your local municipal landfill site.

### **In the event of any direct exposure/contact to this plant**

If you get sap on your skin wash the area well with soap and water. Keep the affected area out of the sun. If photo dermatitis (inflammation of the skin caused by exposure to sunlight) occurs, see a doctor.

If you get sap in your eye, flush your eye with water immediately and see a doctor immediately.





Giant hogweed seedling.  
Photo courtesy of Rachel Gagnon, Ontario Invasive Plant Council.

If you think you have Giant hogweed on your property or if you see it in your community please call the Invading Species Hotline at 1-800-563-7711 or report your sighting online at [www.invadingspecies.com/Report.cfm](http://www.invadingspecies.com/Report.cfm). You will be asked to send in photos for identification. Do not collect parts of the plant for identification.

The Ontario Ministries of Agriculture, Food and Rural Affairs, Health and Long Term Care, Environment, and Natural Resources are working together with our partners (in particular Ontario Federation of Anglers and Hunters, Ontario Invasive Plant Council, Municipalities and Conservation Authorities) to provide information on the identification and control of Giant hogweed.

## Other Resources

Ontario Invasive Plant Council

Invading Species Awareness Program

[ontario.ca/invasivespecies](http://ontario.ca/invasivespecies)

Ontario Ministry of Agriculture, Food  
and Rural Affairs

Ontario Weeds

## For More Information

Contact the Invading Species Awareness  
Program hotline at 1-800-563-7711.