

**Solicitation No. 5P201-20-0104**

**North East Trail: Rouge National Urban Park  
Parks Canada**

# **SPECIFICATION** **DOCUMENTS**

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Spring 2021

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**1. OWNER:**

Parks Canada  
10725 Reesor Road  
Markham, Ontario  
L6B 1A8

**2. PROJECT:**

**North East Trail**  
Rouge National Urban Park  
Pickering, Ontario  
L0C 1A0

**3. PROFESSIONAL SEALS AND SIGNATURES:**

**LANDSCAPE ARCHITECT OF RECORD**

**DILLON CONSULTING LIMITED**  
1155 North Service Road West, Unit #14  
Oakville, Ontario  
L6M 3E3

**Leighann Braine**

Landscape Architect of Record



**January 29, 2021**

Date

**STRUCTURAL ENGINEER OF RECORD**

**DILLON CONSULTING LIMITED**  
51 Breithaupt Street, Suite #200  
Kitchener, Ontario  
N2H 5G5

**Michael Hayman**

Structural Engineer of Record



**January 29, 2021**

Date

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**TRAFFIC OPERATIONS ENGINEER OF RECORD**

**DILLON CONSULTING LIMITED**  
177 Colonnade Road South, Suite #101  
Ottawa, Ontario  
K2E 7J4

**Doug Green**  
Traffic Operations Engineer of Record



January 29, 2021  
Date

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<b>SHEET</b>	<b>DWG.</b>	<b>DESCRIPTION</b>
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**END OF DRAWING LIST**

**ARTICLE SC1 Limit of the Working Area**

On the PCA Representative's land, the Contractor shall limit his operations to the trail corridor and limits of work indicated on drawings for proposed trails, limit of the material staging areas, the parking area, fencing, boardwalk and associated silt and tree protection as indicated on the drawings, unless otherwise approved by the PCA Representative.

The Contractor must obtain all necessary permits for the Work.

The Contractor must notify the PCA Representative three (3) days prior to the start of construction activity.

**ARTICLE SC2 Existing Utilities and Services**

The Contractor shall be responsible for locating and adequately protecting all existing utilities and services and for permanently supporting utilities which cross over the services to be constructed under this Contract.

The utility companies require that their own forces are employed to repair any damages to these utilities. The Contractor shall reimburse the utility companies for any cost associated with these repairs.

**ARTICLE SC3 Independent Testing**

The Contractor will retain independent specialized testing companies to provide material quality control services. Contractor to provide a Testing Plan prior to the commencement of work. The Testing must outline the Contractor's approach, timing and frequency of testing in conformance with the OPSS 501, OPSS 1010 and in accordance with applicable specifications.

- Gradation Tests

Provide gradation tests for granular or stone aggregates, backfill material and granular or stone base material as required to verify conformance with the applicable specifications.

**ARTICLE SC4 – Regular Meetings**

The Contractor shall be required to attend regular meetings on site to review the progress of the Work with the PCA Representative.

**ARTICLE SC5 – Geotechnical Investigation – Appendix A**

A soils investigation was carried out for certain sections of the trail where structures such as boardwalks and staircases are proposed, with engineering recommendations for helical piers, granular trail design, excavation and groundwater control. See Appendix A.

**ARTICLE SC6 Existing Property Limits**

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The Contractor shall be responsible for locating and adequately marking all existing property limits, including adjacent roads right-of-way for work to be constructed under this Contract.

The utility companies require that their own forces are employed to repair any damages to these utilities. The Contractor shall reimburse the utility companies for any cost associated with these repairs.

#### **ARTICLE SC7 – Clean Equipment Protocol – Appendix D**

All work shall conform to Ontario Invasive Plants – Clean Equipment Protocol for Industry 2016 - See Appendix D.

#### **ARTICLE SC8 – Butternut BHA Assessment – Appendix C**

Several Category 1 and 2 Butternuts (*Juglans cinerea*) were identified during several site walks when locating the trail alignment. A Butternut Health Assessment (BHA) was completed by the Forest Gene Conservation Authority (FGCA) in May and June 2020. Priority Area 1 falls within the limit of work for this Contract, and protective measures shall be undertaken to ensure their survival. Butternut trees shall be properly protected with temporary fencing as per the contract drawings until Substantial Performance. Maintain existing grade within the fence line of all Butternut trees to be preserved. The area within the protected fencing shall remain undisturbed and free of debris, materials, and construction equipment. See Appendix C.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 56 00 – Temporary Barriers and Enclosures.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises general construction of granite aggregate trails, parking areas, tree removal and pruning, fencing, boardwalks, and seeding, located on lands owned by Parks Canada in the northern part of the Rouge National Urban Park in Pickering, Ontario and Uxbridge, Ontario; and further identified as the North East Trail.
- .2 The items as noted above may vary based upon portion of contract awarded to contractor.

**1.3 CONTRACT METHOD**

- .1 Construct Work under single, stipulated price contract.

**1.4 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Project construction progress schedule in accordance with Section [01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart] [01 32 16.16 - Construction Progress Schedule - Critical Path Method (CPM)].
- .3 Submit site-specific and Work Plan Health and Safety Plan in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.5 WORK SEQUENCE**

- .1 Co-ordinate Progress Schedule and co-ordinate with PCA Representative during construction].
- .2 Maintain fire access/control.
- .3 Protect workers and public safety.

**1.6 CONTRACTOR USE OF PREMISES**

- .1 Use of project site area until Substantial Performance is restricted to the limits of work, trail corridor footprint (3.6m width within forested sections and 12m width within farm field sections), boardwalk and staircase locations, parking areas, and designated staging areas.
- .2 Contractor to maintain traffic access on all roads and farm equipment access routes to farm fields at all times. Existing roads, shoulder and driveways are to be protected.
- .3 Ensure that operations conditions of existing work at completion are still the same, equal to or better than that which existed before new work started.

**1.7 PCA REPRESENTATIVE FURNISHED ITEMS**

- .1 PCA Representative Responsibilities:
  - .1 Review shop drawings, product data, samples, and other submittals.
- .2 Contractor Responsibilities:
  - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to the PCA Representative.
  - .2 Deliver supplier's bill of materials to the PCA Representative.
  - .3 Arrange and pay for delivery to site in accordance with Schedule.
  - .4 Arrange for replacement of damaged, defective or missing items.
  - .5 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to the PCA Representative.
  - .6 Designate submittals and delivery date for each product in progress schedule.
  - .7 Review shop drawings, product data, samples, and other submittals. Submit to PCA Representative notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
  - .8 Receive and unload products on Site.
  - .9 Inspect deliveries; record shortages, and damaged or defective items.
  - .10 Handle products on Site, including uncrating and storage.
  - .11 Protect products from damage, and from exposure to elements.
  - .12 Assemble, install, connect, adjust, and finish products.
  - .13 Provide installation inspections required by public authorities.
  - .14 Repair or replace items damaged by Contractor or subcontractor on site (under Contractor's control).
- .3 Schedule of PCA Representative furnished items:
  - .1 PCA Representative to supply the Molok recycling and trash bins for installation by the Contractor.

**1.8 EXISTING SERVICES**

- .1 Notify the PCA Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Provide alternative routes for personnel, pedestrian and vehicular traffic where necessary.
- .3 Provide signage and/or flag person in order to ensure safety of existing trail users, road users, and site.
- .4 Establish location and extent of service lines in area of work before starting work. Notify PCA Representative of findings.
- .5 Submit schedule for approval by the PCA Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

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- .6 Where unknown services are encountered, immediately advise the PCA Representative and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .8 Record locations of maintained, re-routed and abandoned service lines.
- .9 Construct barriers, as required, in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

## **1.9 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy of each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as specified.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 Execution**

### **3.1 NOT USED**

**END OF SECTION**

**Part 1        General****1.1        RELATED REQUIREMENTS**

- .1        Section 01 56 00 – Temporary Barriers and Enclosures.

**1.2        ACCESS AND EGRESS**

- .1        Design, construct and maintain temporary "access to" and "egress from" work areas, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

**1.3        USE OF SITE AND FACILITIES**

- .1        Execute work with least possible interference or disturbance to normal use of premises, adjacent roadways, farm fields and pedestrian trails. Make arrangements with PCA Representative to facilitate work as stated.
- .2        Accept liability for damage, safety of equipment and overloading of existing equipment.
- .3        Use of project site area until Substantial Performance is restricted to the limits of work, trail corridor footprint (3.6m width within forested sections and 12m width within farm field sections), boardwalk and staircase locations, parking areas, and designated staging areas.

**1.4        EXISTING SERVICES**

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

**1.5        SPECIAL REQUIREMENTS**

- .1        Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .2        Keep within limits of work and avenues of ingress and egress.
- .3        Ingress and egress of Contractor vehicles at site is limited to locations noted on plans.

**Part 2        Products****2.1            NOT USED**

.1        Not Used.

**Part 3        Execution****3.1            NOT USED**

.1        Not Used.

**END OF SECTION**

**Part 1        General****1.1            REFERENCE STANDARDS**

- .1      PCA/Contractor Agreement
- .2      Special Conditions – 00 82 00

**1.2            APPLICATIONS FOR PROGRESS PAYMENT**

- .1      Refer to PCA/Contractor Agreement and Special Conditions – 00 82 00.
- .2      Make applications for payment on account as provided in Agreement as Work progresses.
- .3      Date applications for payment last day of agreed payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .4      Submit to PCA Representative, at least 14 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment.

**1.3            SCHEDULE OF VALUES**

- .1      Refer to PCA/Contractor Agreement.
- .2      Provide schedule of values supported by evidence as PCA Representative may reasonably direct and when accepted by PCA Representative, be used as basis for applications for payment.
- .3      Include statement based on schedule of values with each application for payment.
- .4      Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as PCA Representative may reasonably require to establish value and delivery of products.

**1.4            PROGRESS PAYMENT AND HOLDBACK**

- .1      Refer to PCA/Contractor Agreement and Special Conditions - 00 82 00.

**Part 2        Products****2.1            NOT USED**

- .1      Not Used.

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**Part 3          Execution**

**3.1              NOT USED**

.1          Not Used.

**END OF SECTION**

**Part 1        General****1.1            RELATED REQUIREMENTS**

- .1        Section 01 33 00 – Submittal Procedures
- .2        Section 01 56 00 – Temporary Barriers and Enclosures
- .3        Section 01 78 00 – Closeout Submittals

**1.2            ADMINISTRATIVE**

- .1        Schedule and administer project meetings throughout the progress of the work at the call of PCA Representative.
- .2        Preside at meetings.
- .3        Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**Part 2        Products****2.1            NOT USED**

- .1        Not Used.

**Part 3        Execution****3.1            NOT USED**

- .1        Not Used.

**END OF SECTION**

**Part 1        General****1.1        RELATED REQUIREMENTS**

- .1        Section 01 45 00 – Quality Control.

**1.2        REFERENCE STANDARDS**

- .1        Refer to PCA/Contractor Agreement.

**1.3        ADMINISTRATIVE**

- .1        Submit to PCA Representative submittals listed 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 PCA 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 PCA 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 PCA Representative's review of submittals.
- .9        Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by PCA Representative's review.
- .10        Keep one reviewed copy of each submission on site.

**1.4        SHOP DRAWINGS AND PRODUCT DATA**

- .1        Refer to PCA/Contractor Agreement.
- .2        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.
- .3        Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

- .4 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.
- .5 Allow 5 business days for PCA Representative's review of each submission.
- .6 Adjustments made on shop drawings by PCA Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to PCA Representative prior to proceeding with Work.
- .7 Make changes in shop drawings as PCA Representative may require, consistent with Contract Documents. When resubmitting, notify PCA Representative in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .9 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.
  - .11 Quantities
- .10 After PCA Representative's review, distribute copies.
- .11 Submit electronic copy of required project documents, including but not necessarily limited to:
  - .1 Work Schedule
  - .2 Testing Plan
  - .3 Site Specific Health and Safety Plan in accordance with Section 01 35 29.06 – Health and Safety Requirements
- .12 Submit an electronic copy of shop drawings for each requirement requested in specification Sections and as PCA Representative may reasonably request, including but not necessarily limited to:
  - .1 Helical Pile Layout for all boardwalk sections
  - .2 Structural members
  - .3 Staircase structures
- .13 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by PCA Representative where shop drawings will not be prepared due to standardized manufacture of product, including but not necessarily limited to:
  - .1 Offset P-Gates
  - .2 Removable Bollards
  - .3 Farm Gates
  - .4 Double Farm Gates
  - .5 Farm Access Chain Closure
- .14 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by PCA Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 1 year of date of contract award for project.
- .15 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by PCA Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.

- .16 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by PCA Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Safety Data Sheets concerning impedances, hazards and safety precautions.
- .17 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by PCA Representative.
- .18 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .19 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by PCA Representative.
- .20 Supplement standard information to provide details applicable to project.
- .21 If upon review by PCA Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .22 The review of shop drawings by PCA Representative is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PCA Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

**1.5 SAMPLES**

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to PCA Representative's business address.
- .3 Notify PCA 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 PCA Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to PCA Representative prior to proceeding with Work.

- .6 Make changes in samples which PCA 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.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures.

**1.2 REFERENCE STANDARDS**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .3 Province of Ontario
  - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. [1990, c.O.1, as amended and O. Reg. 213/91 as amended] - Updated [2005].

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit electronic copies of Contractor's authorized representative's work site health and safety inspection weekly reports to PCA Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 – Submittal Procedures.
- .7 PCA Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to PCA Representative within 7 days after receipt of comments from PCA Representative.
- .8 PCA Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

**1.4 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

**1.5 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

**1.6 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with PCA Representative prior to commencement of Work.

**1.7 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

**1.8 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 PCA Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**1.9 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 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 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.

**1.10 COMPLIANCE REQUIREMENTS**

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.

**1.11 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise PCA Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise PCA Representative and follow procedures

in accordance with Acts and Regulations of Province having jurisdiction and advise PCA Representative verbally and in writing.

**1.12 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with this project.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work [and report directly to and be under direction of site supervisor.

**1.13 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with PCA Representative. Post at all access points to construction site.

**1.14 CORRECTION OF NON-COMPLIANCE**

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

**1.15 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.

**Part 2 Products****2.1 NOT USED**

- .1 Not used.

**Part 3          Execution****3.1                NOT USED**

.1          Not used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Not applicable.

**1.2 REFERENCE STANDARDS**

- .1 Refer to PCA/Contractor Agreement

**1.3 INSPECTION**

- .1 Allow PCA Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by PCA Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 PCA Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

**1.4 INDEPENDENT INSPECTION AGENCIES**

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

**1.5 ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

**1.6 PROCEDURES**

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

**1.7 REJECTED WORK**

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

**1.8 REPORTS**

- .1 Submit digital copies of inspection and test reports to PCA Representative.
- .2 Provide copies to manufacturer or fabricator of material being inspected or tested subcontractor of work being inspected or tested.

**1.9 TESTS AND MIX DESIGNS**

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

**1.10 MILL TESTS**

- .1 Submit mill test certificates as required of specification Section 31 62 116.16 – Steel Helical Piles.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

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**Part 3          Execution**

**3.1              NOT USED**

.1          Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 00 82 00 - Special Conditions

**1.2 REFERENCE STANDARDS**

- .1 Refer to PCA/Contractor Agreement
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.189-[00], Exterior Alkyd Primer for Wood.
  - .2 CGSB 1.59-[97], Alkyd Exterior Gloss Enamel.
- .3 CSA Group (CSA)
  - .1 CSA-A23.1/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-0121-[M1978 (R2003)], Douglas Fir Plywood.
  - .3 CAN/CSA-Z321-[96 (R2001)], Signs and Symbols for the Occupational Environment.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

**1.4 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Provide construction facilities in order to execute work expeditiously.
- .4 Remove from site all such work after use.

**1.5 SITE STORAGE/LOADING**

- .1 Refer to Section 00 82 00 - Special Conditions, Article SC2
- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

**1.6 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site in designated staging areas provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.

**1.7 EQUIPMENT, TOOL AND MATERIALS STORAGE**

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

**1.8 SANITARY FACILITIES**

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

**1.9 CONSTRUCTION SIGNAGE**

- .1 Provide and erect project signs, as well as Health & Safety signage at each staging area, within three weeks of signing Contract, in locations designated by PCA Representative. Wording in both official languages.
- .2 Indicate on sign, Parks Canada Agency (PCA), name of Contractor and Subcontractor, of design style established by the PCA Representative.
- .3 No other signs or advertisements, other than warning signs are permitted on site.
- .4 Locate project identification sign as directed by PCA Representative and construct as follows:
  - .1 Build a secure foundation/buried posts, erect framework, and attach signboard to framing.
- .5 Signs and notices for safety and instruction in both official languages. Graphic symbols to CAN/CSA-Z321.
- .6 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by PCA Representative.

**1.10 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by PCA Representative.
- .2 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

- .3 Protect travelling public from damage to person and property.
- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .6 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .7 Dust control: adequate to ensure safe operation at all times.
- .8 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

**1.11 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways daily.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.
- .5 Remove and restore construction facilities site upon completion of work to equal or better condition than prior to construction, to the satisfaction of the PCA Representative.

**Part 2 Products****2.1 NOT USED****Part 3 Execution****3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, watercourses, and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls other than Filtrexx Silt Soxx, and restore and stabilize areas disturbed during removal.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**1.2 REFERENCE STANDARDS**

- .1 Canadian General Standards Board (CGSB)
  - .1 CGSB 1.59-[97], Alkyd Exterior Gloss Enamel.
  - .2 CAN/CGSB 1.189-[00], Exterior Alkyd Primer for Wood.
- .2 CSA Group (CSA)
  - .1 CSA-O121-[M1978 (R2003)], Douglas Fir Plywood.

**1.3 INSTALLATION AND REMOVAL**

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

**1.4 HOARDING**

- .1 Erect temporary site enclosures using 50 x 50 mm construction grade lumber framing at 10.0 m centres maximum, to CSA O121. Ensure posts are 0.6 m above grade with reflective caution tape visible from all sides. Maintain fence in good repair.
- .2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

**1.5 GUARD RAILS AND BARRICADES**

- .1 Provide secure, rigid guard rails and barricades around deep excavations.

**1.6 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

**1.7 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

**1.8 FIRE ROUTES**

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

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

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

**1.10 PROTECTION OF FINISHES**

- .1 Provide protection for finished and partially finished construction finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with PCA Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

**1.11 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1        General****1.1           RELATED REQUIREMENTS**

- .1        Section 01 33 00 – Submittal Procedures
- .2        Section 01 74 21 – Construction/Demolition Waste Management and Disposal

**1.2           ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Submit written request in advance of cutting or alteration which affects:
  - .1        Structural integrity of elements of project.
  - .2        Integrity of weather-exposed or moisture-resistant elements.
  - .3        Efficiency, maintenance, or safety of operational elements.
  - .4        Visual qualities of sight-exposed elements.
  - .5        Other Work of PCA.
- .3        Include in request:
  - .1        Identification of project.
  - .2        Location and description of affected Work.
  - .3        Statement on necessity for cutting or alteration.
  - .4        Description of proposed Work, and products to be used.
  - .5        Alternatives to cutting and patching.
  - .6        Effect on other Work of PCA.
  - .7        Written permission of affected PCA work by PCA Representative.
  - .8        Date and time work will be executed.

**1.3           MATERIALS**

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

**1.4           PREPARATION**

- .1        Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2        After uncovering, inspect conditions affecting performance of Work.
- .3        Beginning of cutting or patching means acceptance of existing conditions.
- .4        Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

**1.5 EXECUTION**

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

**1.6 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

**1.2 REFERENCE STANDARDS**

- .1 Refer to PCA/Contractor Agreement and Section 00 82 00 – Special Conditions.

**1.3 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, caused by the Contractor.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by PCA Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to site, bank/pile snow in designated areas only as indicated by the PCA Representative, or remove from site.
- .4 Remove non-organic waste and debris within 10m either side of proposed trail corridors that is encountered during construction. This includes but is not limited to, isolated pieces of metal scraps, rolls of wire fence, car hoods, old tires, rusted drums, refrigerators, wood structures, asphalt shingles, an old trailer, BBQs, paint cans, oil cans, insecticide cans, electronics, glass bottles and plastic scraps.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Provide on-site containers for collection of waste materials and debris.
- .7 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Waste Management and Disposal.
- .8 Dispose of waste materials and debris at designated dumping areas off-site.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

**1.4 FINAL CLEANING**

- .1 Refer to PCA/Contractor Agreement and Section 00 82 00 – Special Conditions.
- .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.

- .5 Remove waste products and debris caused by Contractor.
- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by PCA Representative.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Remove stains, spots, marks and dirt from decorative work.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .11 Remove dirt and other disfiguration from exterior surfaces.
- .12 Clean drainage systems.
- .13 Sweep and wash clean paved areas.
- .14 Remove debris and surplus materials.
- .15 Sweep with metal detector to pick up loose metals.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor's commitment to reduce and divert waste materials from landfill.
- .2 PCA has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 52 00 - Construction Facilities

**1.3 REFERENCE STANDARDS**

- .1 ASTM International (ASTM)
  - .1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program
- .2 Recycling Certification Institute (RCI):
  - .1 RCI Certification Construction and Demolition Materials Recycling

**1.4 DEFINITIONS**

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, operations, and demolition.
- .3 Class III: Non-hazardous Waste - Construction and demolition waste.
- .4 Inert Fill: Inert waste – Exclusively asphalt and concrete.
- .5 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .6 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .7 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.
- .8 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .9 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

- .10 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .11 Return: To give back reusable items or unused products to vendors for credit.
- .12 Reuse: To reuse a construction waste material in some manner on the project site.
- .13 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .14 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .15 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .16 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .17 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .18 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
  - .1 Solvents in paints and other coatings;
  - .2 Wood preservatives; strippers and household cleaners;
  - .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
  - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .19 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

## **1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.
- .2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 - Project Meetings before starting any Work of the Contract attended by the PCA Representative, to discuss the Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

**1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide required information in accordance with Section 01 33 00 - Submittal Procedures.

**1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
  - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
  - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.
- .4 Store materials to be reused, recycled, and salvaged in locations as directed by PCA Representative.
- .5 Unless specified otherwise, materials for removal do not become Contractor's property.
- .6 Protect, stockpile, and store salvaged items.
- .7 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facilities.
- .8 Protect surface drainage, mechanical and electrical from damage and blockage.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Provide waybills for separated materials.

**1.8 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, or paint thinner into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

**1.9 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference of disturbance to normal use of premises.

**1.10 SCHEDULING**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 APPLICATION**

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**3.2 CLEANING**

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

**3.3 DIVERSION OF MATERIALS**

- .1 Separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by PCA Representative, and consistent with applicable fire regulations
  - .1 Mark Containers or stockpile areas.
  - .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged materials is not permitted.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 74 00 – Cleaning
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

**1.2 REFERENCE STANDARDS**

- .1 PCA/Contractor Agreement and Section 00 82 00 – Special Conditions.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1 Notify PCA Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2 Request PCA Representative's inspection.
  - .2 PCA Representative's Inspection:
    - .1 PCA Representative and Contractor to inspect Work and identify defects and deficiencies.
    - .2 Contractor to correct Work as directed.
  - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Equipment and systems: tested, and fully operational.
    - .4 Operation of systems: demonstrated to PCA Representative's personnel.
    - .5 Work: complete and ready for final inspection.
  - .4 Final Inspection:
    - .1 When completion tasks are done, request final inspection of Work by PCA Representative, and Contractor.
    - .2 When Work incomplete according to PCA Representative, complete outstanding items and request re-inspection.
  - .5 Declaration of Substantial Performance: when PCA Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

- .6 Commencement of Lien and Warranty Periods: date of PCA Representative's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
  - .1 When PCA Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
  - .2 Refer PCA/Contractor Agreement when Work deemed incomplete by PCA Representative, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

**1.4 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 31 19 – Project Meetings
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 45 00 – Quality Control

**1.2 REFERENCE STANDARDS**

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

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting [one] week prior to contract completion with PCA Representative, in accordance with Section 01 31 19 - Project Meetings to:
    - .1 Verify Project requirements.
    - .2 Review manufacturer's installation instructions.
  - .2 PCA Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the PCA Representative, four final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

**1.5           FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf [219 x 279] mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in .dwg format on CD.

**1.6           CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

**1.7           AS-BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, for PCA Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.

- .3 Addenda.
- .4 Change Orders and other modifications to Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Field test records.
- .7 Inspection certificates.
- .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by PCA Representative.

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

- .1 Record information on set of black line opaque drawings, provided by PCA Representative.
- .2 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .3 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .2 Field changes of dimension and detail.
  - .3 Changes made by change orders.
  - .4 Details not on original Contract Drawings.
  - .5 Referenced Standards to related shop drawings and modifications.
- .4 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .5 Other Documents: maintain field test records, inspection certifications, and manufacturer's certifications, required by individual specifications sections.
- .6 Provide digital photos, if requested, for site records.

**1.9 WARRANTIES AND BONDS**

- .1 Conduct 11 month warranty inspection, measured from time of acceptance, by PCA Representative.
- .2 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Contractor's plans for attendance at 11 month post-construction warranty inspections.
- .3 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .4 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the PCA Representative to proceed with action against Contractor.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 REFERENCE STANDARDS**

- .1 ASTM International (ASTM)
  - .1 ASTM A123/A123M-[15], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM A153/A153M-[09] Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - .3 ASTM A307-[14] Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
  - .4 ASTM A653/A653M-[15], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5 ASTM D 5055-[13e1], Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
  - .6 ASTM D 5456-[14b], Standard Specification for Evaluation of Structural Composite Lumber Products.
  - .7 ASTM F1667-[13] Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-11.3-[M87], Hardboard.
  - .2 CAN/CGSB-71.26-[M88], Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .3 Canadian Wood Council
  - .1 Wood Design Manual [2010 (R2014)] Edition
  - .2 Engineering Guide for Wood Frame Construction [2014]
- .4 CSA Group (CSA)
  - .1 CSA B111-[1974 (R2003)], Wire Nails, Spikes and Staples.
  - .2 CSA O86-[14] Engineered Design in Wood
  - .3 CSA O112.9-[10], Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
  - .4 CSA O121-[08 (R2013)], Douglas Fir Plywood.
  - .5 CSA O141-[05 (R2014)], Softwood Lumber.
  - .6 CSA O151-[09 (R2014)], Canadian Softwood Plywood.
  - .7 CSA O153-[13], Poplar Plywood.
  - .8 CSA O325-[07 (R2012)], Construction Sheathing.
  - .9 CAN/CSA-S406-[92 (R2008)], Construction of Preserved Wood Foundations.
  - .10 CAN/CSA-Z809-[08], Sustainable Forest Management.

- .5 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-[2004], FSC Principle and Criteria for Forest Stewardship.
  - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1
  - .3 FSC Accredited Certified Bodies.
- .6 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber [2010].
- .7 National Research Council Canada (NRC)
  - .1 National Building Code of Canada [2015] (NBC).
- .8 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
  - .1 SCAQMD Rule 1168-[A2005], Adhesives and Sealants Applications.
- .9 Sustainable Forestry Initiative (SFI)
  - .1 SFI-[2015-2019] Standard.

**1.2 QUALITY ASSURANCE**

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit manufacturer's installation instructions.
- .3 Shop Drawings:
  - .1 For structural applications submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
  - .2 Include on drawings:
    - .1 Design data in accordance with CAN/CSA-O86 and CWC Engineering Guide for Wood Frame Construction.
    - .2 Indicate configuration and spacing of joists, hanger and connector types, fasteners, locations and design values; bearing details.
    - .3 Submit stress diagrams or print out of computer design indicating design loads for members. Indicate allowable load and stress increase.

- .4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

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

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.
  - .3 Store wood I-beams and I-joists on edge.
  - .4 Stack, lift, brace, cut and notch engineered lumber products in strict accordance with manufacturer's instructions and recommendations.
  - .5 Store and protect exposed lumber from nicks, scratches, and blemishes.
  - .6 Replace defective or damaged materials with new.
  - .7 Store separated reusable wood waste convenient to cutting station and work areas.

### **Part 2 Products**

#### **2.1 FRAMING, DECKING, RAILING, STAIRCASE, AND FENCE BOARDS**

- .1 Lumber: Rough sawn Ontario White Cedar for all visible components/surfaces, except for staircase treads. Pressure treated lumber for staircase treads. Contractor to provide cedar samples to PCA Representative for review and approval prior to ordering and delivery to site.
  - .1 CSA O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .3 SS Grade
- .2 Framing and board lumber: in accordance with NBC.

#### **2.2 ACCESSORIES**

- .1 General purpose adhesive: to CSA O112.9.
- .2 Nails, spikes and staples: to ASTM F1667.
  - .1 75mm (3") galvanized spikes
  - .2 100mm (4") galvanized spikes

- .3 Bolts: galvanized 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Screws:
  - .1 75mm (3") coated deck screws
- .5 Fastener Finishes:
  - .1 Galvanizing: to ASTM A123/A123M, use galvanized fasteners.
- .6 Stair Anchors: 20M reinforcing steel minimum 1000mm length.

**Part 3 Execution****3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install members true to line, levels and elevations, square and plumb.
- .2 Construct continuous members from pieces of longest practical length.
- .3 Install spanning members with "crown-edge" up.
- .4 Select exposed framing for appearance. Install lumber materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .5 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .6 Countersink bolts where necessary to provide clearance for other work.
- .7 Install wood cants, fascia backing, nailers, safety curbs, cedar spacers, and other wood supports as required and secure using galvanized steel fasteners.
- .8 Apply end cut preservative to all cut ends of pressure treated materials.
- .9 Sanding: Top of railings and decking surface to be lightly sanded to remove any splinters. Provide sanded sample area of a 600mm long section of railing top and 1000 x 1000mm decking area for approval by PCA Representative.
- .10 Predrill holes for all applications where large screws are utilized to prevent splitting.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

**3.4 WASTE MANAGEMENT**

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.
- .3 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.
- .4 Do not burn scrap lumber that has been pressure treated.
- .5 Do not send lumber treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

**3.5 PROTECTION**

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

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 14 00 – Work Restrictions

**1.2 REFERENCES**

- .1 The publications listed below (latest revision applicable) form a part of this specification to the extent referenced herein. The publications are referred to within the text by the designation only.
  - .1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)  
Methods:
    - .1 ASTM D-638-Tensile Properties of Plastics
    - .2 ASTM D-790-Flexural Properties of Unreinforced and Reinforced Plastics
    - .3 ASTM D-2344-Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short Beam Method
    - .4 ASTM D-696-Coefficient of Linear Thermal Expansion for Plastics
    - .5 ASTM E-84-Surface Burning Characteristics of Building Materials

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 The contractor shall furnish shop drawings of all fabricated structural systems and accessories in accordance with the provisions of this section
- .3 The contractor shall furnish manufacturer's shop drawings clearly showing material sizes, types, styles, part or catalog numbers, complete details for the fabrication of and erection of components including, but limited to location, lengths, type and sizes of fasteners, clip angles, members sizes, and connection details sealed by a Professional Engineer licensed to practice in Ontario.
- .4 The contractor shall submit the manufacturer's published literature including structural design data, structural properties data, corrosion resistance tables, certifications of compliance, test reports as applicable, and design calculations for systems not sized or designed in the contract documents, sealed by a Professional Engineer licensed to practice in the province of Ontario.
- .5 The contractor may be requested to submit sample pieces of each item specified herein for acceptance by a PCA Representative as to quality and colour. Sample pieces shall be manufactured by the method to be used in the work.

**1.4 QUALITY ASSURANCE**

- .1 All items to be provided under this Section shall be furnished only by manufacturers having a minimum of ten (10) years' experience in the design and manufacture of similar products and systems. Additionally, if requested, a record

of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided.

- .2 Manufacturer shall offer a 3 year limited warranty on all FRP products against defects in materials and workmanship.
- .3 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .4 Protect structural members from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .5 Replace damaged members as directed by PCA Representative.

## **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Divert unused, or cut off materials from landfill to local facility as approved by PCA Representative.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Structural shapes shall be similar to those components indicated on the structural drawings as manufactured by (or approved equal):  
Fibergrate Composite Structure Inc.  
5151 Belt Line Road, Suite 1212  
1000 Thornton Road South, Unit E  
Oshawa, ON L1J 7E2  
(877) 771-7764
- .2 Contractor may propose alternative manufacture to the PCA Representative for approval. The products shall have similar size and equal or better strength than those fabricated by Fibergrate.
- .3 The resin of fibreglass components shall have dark colour.
- .4 All structural shapes are to be manufactured by the pultrusion process with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fibreglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.
- .5 Fibreglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

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- .6 Resins shall be ISOFR, fire retardant isophthalic polyester or VEFR, fire retardant vinyl ester, with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required.
- .7 All finished surfaces of RFP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.
- .8 All pultruded structural shapes shall be further protected from ultraviolet (UV) attack with 1) integral UV inhibitors in the resin and 2) a synthetic surfacing veil to provide a resin rich surface.
- .9 All fire retardant FRP products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test.
- .10 Pultruded structural shapes are to have the minimum longitudinal mechanical properties listed below:

Property	ASTM Method	Value	Units
Tensile Strength	D-638	30000 (206)	psi (MPa)
Tensile Modulus	D-638	$2.5 \times 10^6$ (17.2)	psi (GPa)
Flexural Strength	D-790	30000 (206)	psi (MPa)
Flexural Modulus	D-790	$1.8 \times 10^6$ (12.4)	psi (GPa)
Flexural Modulus (Full Section)	NA	$2.8 \times 10^6$ (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4500 (31)	psi (MPa)
Shear Modulus (Transverse)	NA	$4.5 \times 10^5$ (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	$4.4 \times 10^{-6}$ ( $8.0 \times 10^{-6}$ )	in/in/°F (cm/cm/°C)
Flame Spread	E84	25 or less	NA

### Part 3 Execution

#### 3.1 PREPARATION

- .1 Fabrication
  - .1 Measurements: Structural shapes supplied shall meet the minimum dimensional requirements as shown or specified. The contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by the manufacturer to complete the work. Determine correct size and locations of required holes or coping from field

dimensions, including as-built survey of installed helical pile locations, before structural shape fabrication.

- .2 Sealing: All shop fabricated cuts or drilling shall be coated with vinyl ester resin to provide maximum corrosion resistance. All field fabricated cuts or drilling shall be coated similarly by the contractor in accordance with the manufacturer's instructions.
- .3 Hardware: Galvanized A325 bolts shall be provided.

### **3.2 INSPECTION**

- .1 Shop inspection is authorized as required by the Owner and shall be at the Owner's expense. The fabricator shall give ample notice to the contractor prior to the beginning of any fabrication work so that inspection may be provided. The structural shapes shall be as free, as commercially possible, from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits.

### **3.3 REPAIR AND RESTORATION**

- .1 Remove rejected structural sections and replace with new.
- .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective structural sections.

### **3.4 CLEANING**

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures

**1.2 REFERENCE STANDARDS**

- .1 American Association of State Highway and Transportation Officials (AASHTO)
  - .1 Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, (5th Edition).
- .2 ASTM International
  - .1 ASTM A123/A123M-[09], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM A276-[10], Standard Specification for Stainless Steel Bars and Shapes.
  - .3 ASTM B209M-[10], Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
  - .4 ASTM B210M-[05], Standard Specification for Aluminum-Alloy Drawn Seamless Tubes [Metric].
  - .5 ASTM B211M-[03], Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire [Metric].
- .3 Canadian General Standards Board (CGSB)
  - .1 CGSB 62-GP-9M-[80], Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.
  - .2 CGSB 62-GP-11M-[78], Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing and Amendment.
- .4 CSA Group (CSA)
  - .1 CSA G40.20/G40.21-[04 (R2009)], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA O80 Series-[08], Wood Preservation.
  - .3 CSA O121-[08], Douglas Fir Plywood.
  - .4 CSA W47.2-[11], Certification of Companies for Fusion Welding of Aluminum.
  - .5 CAN/CSA-Z809-[08], Sustainable Forest Management.
- .5 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-[2004], FSC Principle and Criteria for Forest Stewardship.
- .6 Green Seal Environmental Standards (GS)
  - .1 GS-11-[11], Paints and Coatings.

- .7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-[A2011], Architectural Coatings.
- .8 Sustainable Forestry Initiative (SFI)
  - .1 SFI-[2010-2014] Standard.
- .9 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - [current edition].

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for traffic signage, including product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate materials, thicknesses, sizes, finishes, colours, construction details, and schedule of signs and quantities.
  - .2 Submit drawn-to-scale details for individually fabricated signs and lettering indicating word and letter spacing.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and recycling as specified in Section 01 74 19 - Waste Management and Disposal.

## Part 2 Products

### 2.1 DESIGN CRITERIA

- .1 Structural deflections and vibration in accordance with American Association of State Highway and Transportation Officials (AASHTO), "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals".

**2.2 MATERIALS**

- .1 Sign supports:
  - .1 Steel posts: to CSA G40.21, [4] m long, flanged "U" shaped in cross section, perforated, measuring [65] mm wide x [30] mm deep. Metal thickness: [4.5] mm. Hot dipped galvanized: to ASTM A123/A123M, minimum zinc coating [\_\_\_\_\_] g/m<sup>2</sup>.
  - .2 Standard 50mm Telespar tubular supports for small signs: to ASTM B210M. Posts to be perforated.
  - .3 Timber posts:
    - .1 Sawn timber posts:
      - .1 Species: Peeled Ontario White Cedar
      - .2 Type: Stripped of Bark
      - .3 Grade: 1
      - .4 Dimensions: as indicated
      - .5 CAN/CSA-Z809 or FSC or SFI certified.
    - .2 Posts to be treated in accordance with CAN/CSA O80 Series.
  - .4 Vertical tubular supports and connecting diagonal members: to ASTM B210M.
  - .5 Truss members: to ASTM B210M.
  - .6 Aluminum tubular members: belt ground satin finish.
  - .7 Base plates for ground mounted signs: to ASTM B209M. Base plates for overhead supports: to ASTM B209M.
  - .8 Tubular support caps for ground mounted signs: to ASTM B210M or fabricated from aluminum plate as specified in ASTM B209M. Castings for overhead signs: to ASTM B211M.
  - .9 Aluminum flanges: to ASTM B211M.
  - .10 Corrosion preventive compound: to [\_\_\_\_\_].
  - .11 Anchor and connecting bolts, 'U' clamps and miscellaneous hardware for overhead sign installations: fabricate from 304 stainless steel as specified in ASTM A276.
  - .12 Fasteners: bolts, nuts, washers and other hardware for roadside signs to be cast aluminum alloy, or galvanized steel.
- .2 Signboards:
  - .1 Aluminum sheet: to ASTM B209M, precut to required dimensions.
    - .1 Thickness for signboards up to 750 mm wide: 1.6 mm minimum.
    - .2 Thickness for signboards 750-1200 mm wide: 2.1 mm minimum.
    - .3 Thickness for refurbishing existing sign panels: 1.0 mm minimum.
  - .2 T-shape stiffeners for signboards: to ASTM B210M.
  - .3 Connecting straps and brackets: to ASTM B209M.
  - .4 Aluminum materials: to ASTM B209M.

**2.3 FABRICATION**

- .1 Supports:
  - .1 Connect aluminum support members by welding in accordance with CSA W47.2. Work to be performed by Canadian Welding Bureau qualified members only. Flame cutting of members not permitted.
  - .2 Welds to be of same strength as adjacent member or casting.
  - .3 Reinforce in area of electrical hand holes to equal strength of full section member.
  - .4 Remove sharp edges and burrs.
  - .5 Aluminum blanks:
    - .1 Degrease, etch and bonderize with chemical conversion coating.
    - .2 Clean surfaces with xylene thinner. Dry.
    - .3 For non-reflective signs, spray face with one coat vinyl pretreatment coating and two finish coats of required colour.
    - .4 For aluminum signboards that are to be painted before installation, spray and bake face of signboards with two coats of enamel in accordance with MPI-EXT 5.4A.
  - .6 Reflective background sheeting and lettering:
    - .1 Cut and apply in accordance with manufacturer's instructions.
    - .2 Apply adhesive coated material with heat lamp vacuum applicator or by squeeze roll application method. Apply pressure sensitive material with roller or squeegee.
    - .3 Edge wrap sheeting on each extrusion prior to bolting extrusions. Match pieces of sheeting from different rolls for each signboard to ensure uniform appearance and brilliance by day and night.
    - .4 Reflective signboard faces may be prepared using silk screen transparent ink.
  - .7 Non-reflective lettering and symbols: cut from vinyl film as specified in CGSB 62-GP-9M, or paint using required colour of finish paint [maximum VOC of [350] [250] [GS-11] [SCAQMD Rule 1113]] or silk screen transparent ink.
  - .8 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.
  - .9 Protect finished signboard faces with one coat of clear varnish [with maximum VOC limit of [SCAQMD Rule 1113] [350]].
- .2 Sign identification:
  - .1 Apply sign number and date of installation with 25 mm high [stencil painted] black letters on lower left back face of each signboard.

**Part 3 Execution****3.1 INSTALLATION****.1 Sign support:**

- .1 Erect supports as indicated. Permissible tolerance: 50 mm maximum departure from vertical for direct buried supports. Where separate concrete footings have been placed, erect posts with base plates resting on levelling nuts and restrained with nuts and washers. Permissible tolerance: 12 mm maximum departure from vertical.
- .2 Coat underside of base plate with corrosion protective paint before installation. Connect shoe base to shaft with inside and outside fillet welds.
- .3 Close open aluminum tubes and posts with aluminum cap. Cut oblong holes in shoe bases to drain condensation. Install aluminum bolt cover on each base plate restraining nut.
- .4 Erect posts plumb and square to details as indicated.
- .5 Single channel steel posts:
  - .1 Drive to required depth without damage to posts.
  - .2 If rock or concrete is encountered, drill hole to required depth and set post in sand.
  - .3 In finished concrete surfaces, backfill with concrete or grout. Protect from adverse conditions until cured.
- .6 Wooden post installation:
  - .1 Excavate post holes to 150 mm minimum diameter. Compact bottom of hole to provide firm foundation. Set post and backfill in 150 mm layers with excavated material. Compact each layer before placing each subsequent layer.

**.2 Signboard:**

- .1 Fasten signboard[s] to supporting posts and brackets as indicated.
- .2 Use strapping with crimped or bolted connections where signs fastened to utility poles.
- .3 Use T-shape aluminum stiffeners to join portions of sign panel on site. Cover face of T-stiffener with material identical to face of sign panel.

**3.2 CORRECTING DEFECTS**

- .1 Correct defects, identified by PCA Representative, in sign message, consistency of reflectivity, colour or illumination.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
  - .1 Carefully dismantle and salvage wood, aluminum and steel materials for reuse and recycling.
  - .2 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by traffic signage installation and salvage operations.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 32 11 23 – Aggregate Base Courses

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
- .2 CSA Group (CSA)
  - .1 CSA A23.1/A23.2-[09], Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .3 Ontario Provincial Standard Specifications (OPSS)
  - .1 OPSS 1004-05, Material Specification for Aggregates-Miscellaneous.
  - .2 OPSS SP 110F13-03, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

**Part 2 Products****2.1 MATERIALS**

- .1 Granular A to OPSS SP 110F13. Sand to OPSS 1004.
- .2 Granular B Type I to OPSS SP 110F13. Sand to OPSS 1004.

**Part 3 Execution****3.1 EXAMINATION**

- .1 Verification of Conditions:
  - .1 Before commencing work verify locations of buried services on and adjacent to site.
- .2 Evaluation and Assessment:
  - .1 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.
  - .2 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by PCA Representative.

- .3 Not later than 48 hours before backfilling or filling with approved material, notify PCA Representative so that compaction tests can be carried out by designated testing agency.
- .4 Before commencing work, conduct, with PCA Representative, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, and paving, survey bench marks and monuments which may be affected by work.

### **3.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with sediment and erosion control plan.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls other than Filtrexx Silt Soxx and restore and stabilize areas disturbed during removal.
- .2 Protection of in-place conditions:
  - .1 Protect excavations from freezing.
  - .2 Keep excavations clean, free of standing water, and loose soil.
  - .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to PCA Representative's approval.
  - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
  - .5 Protect buried services that are to remain undisturbed.
- .3 Removal:
  - .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
  - .2 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings and within the 3.6m wide clearing width indicated on the drawings.
  - .3 Carefully remove soil around roots of trees to remain.

### **3.3 EXCAVATION**

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.
- .2 Topsoil stripping:
  - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

- .2 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
- .3 Strip topsoil over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
- .4 Stockpile in locations as indicated.
- .3 Excavate as required to carry out work, in all materials met.
  - .1 Do not disturb soil or rock below bearing surfaces. PCA Representative when excavations are complete.
  - .2 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

**3.4 SITE QUALITY CONTROL**

- .1 Fill material and spaces to be filled to be inspected and approved by PCA Representative.

**3.5 BACKFILLING**

- .1 Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from PCA Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing subgrade under trails to same compaction as specified for fill. Fill excavated areas with selected subgrade material compacted as specified for fill.
- .5 Placing:
  - .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
- .6 Compaction: compact each layer of material to following densities for material to ASTM D698:
  - .1 To underside of basecourses: 100% SPDD or in accordance with Geotechnical Report
  - .2 Basecourses: 100% SPMDD or in accordance with Geotechnical Report
- .7 Under seeded and sodded areas: use site excavated material to bottom of topsoil.
- .8 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

**3.6 GRADING**

- .1 Grade to ensure that water will drain away from farm fields, seating areas, buildings, walls and paved areas, to catch basins and other disposal areas

approved by PCA Representative. Grade to be gradual between finished spot elevations as indicated.

**3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Dispose of cleared and grubbed material off site daily.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 32 11 23 – Aggregate Base Courses

**1.2 REFERENCE STANDARDS**

- .1 ASTM International (ASTM)
  - .1 ASTM D4791-[10], Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
  - .2 Allow continual sampling by PCA Representative during production.
  - .3 Provide PCA Representative with access to source and processed material for sampling.
  - .4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products****2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, invasive plants, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates (Granite Screenings) satisfying requirements of applicable section to be the following:
  - .1 Granite screenings produced in crushing of quarried rock, boulders, gravel or slag.
  - .2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117.

Sieve Designation	% Passing
9.5mm	100
4.75mm	50-100
2.00mm	30-65
0.425mm	10-30
0.075mm	5-10
- .4 Coarse aggregates (Granular A & Granular B Type II) satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
  - .3 Granular A and Granular B Type II to: OPSS.MUNI 1010

**2.2 SOURCE QUALITY CONTROL**

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

**Part 3 Execution****3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
  - .1 Visually inspect substrate in presence of PCA Representative.
  - .2 Inform PCA Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with topsoil stripping only after unacceptable conditions have been remedied and after receipt of written approval to proceed from PCA Representative.

**3.2 PREPARATION**

- .1 Topsoil stripping:
  - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
  - .2 Supply and install flags every 10 metres along one side of clear zone prior to commencing clearing and stripping of vegetation. Remove flags only at completion of entire trail aggregate installation.
  - .3 Begin topsoil stripping of areas as indicated after area has been cleared of weeds, brush, grasses, and trees, and these have been removed from the trail corridor.
  - .4 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
  - .5 Stockpile in locations as indicated on plans for reuse. Stockpile height not to exceed 2 m.
  - .6 Strip grasses, forbs, weeds, shrub and tree vegetation as indicated. Remove stoloniferous shrub roots from clear zone prior to placing of geogrid and geofabric.
  - .7 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .2 Processing:
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
    - .1 Use methods and equipment approved in writing by PCA Representative.
- .3 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.

- .4 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
  - .1 Use only equipment approved in writing by PCA Representative.
- .5 Stockpiling:
  - .1 Stockpile aggregates on site in locations as indicated on plans unless directed otherwise by PCA Representative. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Where indicated on plan, provide a layer of coarse wood chip base not less than 200 mm in depth over a non-woven geotextile, Terrafix 270R or approved equal, for areas that have not had an archaeological assessment.
  - .5 Excavation is not permitted during the installation or removal of the protective wood chip covering.
  - .6 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .7 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by PCA Representative within 48 hours of rejection.
  - .8 Stockpile materials in uniform layers of thickness as follows:
    - .1 Maximum 1.5 m for coarse aggregate and base course materials.
    - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
    - .3 Maximum 1.5 m for other materials.
  - .9 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .10 Do not cone piles or spill material over edges of piles.
  - .11 Do not use conveying stackers.
  - .12 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
  - .13 Stockpiled aggregate is to be moved from staging areas within 24 hours maximum.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .5 It is the Contractor's responsibility to remove any unused aggregate on site.
- .6 Staging areas within the Work limits are to be restored as per the proposed layout drawings. Staging areas beyond the fencing within farm fields are to be tilled to a depth of 200mm and left unseeded at the end of Construction.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 14 00 – Work Restrictions
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 45 00 – Quality Control
- .4 Section 31 00 99 – Earthworks for Minor Works

**1.2 MEASUREMENT PROCEDURES**

- .1 Costs for helical pile supply and installation shall be included in the per linear metre unit price for boardwalk construction.
- .2 For bidding purposes, assume galvanized helical piles are 3.0m long each.
- .3 Include all costs for quality control, geotechnical, as-built surveys and load testing in the linear metre price

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to PCA Representative and await further instructions. See Geotechnical investigation report provided by Thurber Engineering Ltd., and appended to these documents.
- .4 Submit schedule of planned sequence of driving to PCA Representative for review, as specified.
- .5 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in Ontario, Canada.
- .6 Equipment:
  - .1 Submit prior to pile installation for review and approval by PCA Representative, list and details of equipment for use in installation of piles.
  - .2 Impact hammers: submit manufacturer's written data as specified.
  - .3 Non-impact methods; submit characteristics to evaluate performance.
- .7 Submit driveability analysis as specified, to PCA Representative for approval of hammers.
- .8 Quality assurance submittals:

- .1 Test reports: submit 3 copies of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

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

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .3 Replace damaged piles as directed by PCA Representative.

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

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Divert unused, or cut off concrete materials from landfill to local facility as approved by PCA Representative.

#### **1.6 EXISTING CONDITIONS**

- .1 Sub-surface investigation report is appended to these documents.
- .2 Notify PCA Representative immediately if the subsurface conditions encountered vary greatly from the information provided in the sub-surface investigation report.

#### **1.7 SCHEDULING**

- .1 Drive piles in accordance with the contract drawings.
- .2 Provide schedule of planned sequence of driving to PCA Representative for review, not less than 2 weeks prior to commencement of pile driving.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Steel helical piles: to CSA-G40.20/G40.21, Grade 400.
  - .1 Size and weight [as indicated] [as specified].
  - .2 For bidding purposes, assume each pile to be 3m long
- .2 Welding materials: to [CSA W48].
- .3 Steel plates and pile caps: to CSA-G40.20/G40.21, Grade 400.
- .4 Exterior protective coating: inorganic zinc to CAN/CGSB-1.171M

- .5 Supply or fabricate full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.
- .6 Splice piles only with written approval of PCA Representative.
  - .1 When permitted, provide details for PCA Representative's review.
  - .2 Design details of splice to bear dated signature stamp of professional engineer registered or licensed in Ontario, Canada.

**2.2 EQUIPMENT**

- .1 Non-impact methods of installation such as augering, jacking, vibratory hammers or other means: provide full details of characteristics necessary to evaluate performance.

**Part 3 Execution****3.1 PREPARATION**

- .1 Protection:
  - .1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.
  - .2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures.
  - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation.
  - .1 Make provision for access and support of piling equipment during performance of Work.
- .3 Pre-boring of holes may be acceptable to facilitate pile alignment control.

**3.2 INSTALLATION**

- .1 Leads: construct pile driver leads to provide free movement of hammer.
  - .1 Hold leads in position at top and bottom, with guys, stiff braces, or other means as approved by PCA Representative to ensure support to pile while being driven.
  - .2 Swing leads:
    - .1 Firmly guy top and bottom to hold pile in position during driving operation.
- .2 Followers:
  - .1 Obtain approval from PCA Representative prior to using followers.
  - .2 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.

- .3 Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.
- .4 Drive applicable load test piles using similar follower.
- .3 Allowable design load capacity of pile at Ultimate Limits States shall be 35 kN vertical and 5 kN lateral.
- .4 Installation of each pile will be subject to PCA Representative review and approval.
  - .1 The PCA Representative will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine load capacity].
  - .2 PCA Representative to approve final driving of all piles prior to removal of pile driving rig from site.
  - .3 Piles shall be tested for a vertical capacity of 60 kN

**3.3 APPLICATION/DRIVING**

- .1 Hold piles securely and accurately in position while driving.
- .2 Remove loose and displaced material from around piles after completion of driving, and leave surfaces flat.
- .3 Cut off piles neatly and squarely at elevations as required.
  - .1 Provide sufficient length above cut-off elevation so that any part damaged during driving may be cut off.
- .4 Remove cut-off lengths from site on completion of work.

**3.4 AS-BUILT SURVEY**

- .1 Complete an as-built survey of driven pile locations and elevations and provide to fibreglass beam supplier prior to the start of fabrication.

**3.5 OBSTRUCTIONS**

- .1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, proceed as directed by PCA Representative.

**3.6 REPAIR AND RESTORATION**

- .1 Remove rejected pile and replace with new, and if necessary, longer pile.
- .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

**3.7 FIELD QUALITY CONTROL**

- .1 Perform pile capacity tests on a minimum of 5% of piles driven, per boardwalk location
- .2 Measurement:

- .1 Maintain accurate records of driving for each pile, including:
  - .1 Type and make of hammer, stroke or related energy.
  - .2 Other driving equipment including water jet, driving cap, cushion.
  - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
  - .4 Sequence of driving piles in group.
  - .5 Final tip and cut-off elevations.
  - .6 Other pertinent information such as interruption of continuous driving, pile damage.
  - .7 Record elevation taken on adjacent piles [during] before and after driving of each pile.
- .2 Provide PCA Representative with three copies of records.

**3.8 CLEANING**

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 29.06 - Health and Safety Requirements

**1.2 MEASUREMENT PROCEDURES**

- .1 Measure tree pruning for payment per tree.

**1.3 REFERENCE STANDARDS**

- .1 American National Standard Institute (ANSI)
  - .1 ANSI A300 (Part 1)-[2001], Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (revision and re-designation of ANSI A300-1995) (includes supplements).
  - .2 ANSI A300 (Part 2)-[1998], Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization.
  - .3 ANSI A300 (Part 3)-[2000], Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - Tree Support Systems (a. Cabling, Bracing, and Guying) (supplement to ANSI A300-1995).
- .2 Canadian Nursery Landscape Association (CNLA)/Canadian Society of Landscape Architects (CSLA)
  - .1 Canadian Landscape Standard [2016], First Edition
  - .2 Canadian Nursery Stock Standard [2017], Ninth Edition
- .3 International Society of Arboriculture (ISA)
- .4 Ontario Ministry of Agriculture, Food and Rural Affairs
  - .1 Publication 483-[2004], Pruning Ornamentals.

**1.4 DEFINITIONS**

- .1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.
- .2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.
- .3 Crown Raising: consists of removal of lower tree branches to provide clearance.
- .4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.
- .5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.
- .6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

**1.5 QUALITY ASSURANCE**

- .1 Certification: provide certification in compliance with the requirements of Canadian Nursery Landscape Association, Landscape Ontario Green for Life (LO), and International Society of Arboriculture (ISA).
- .2 Regulatory requirements: provide safety certificate as approved by local hydro utility.
- .3 Field Samples: do sample pruning in manner to enable PCA Representative to identify:
  - .1 Knowledge of target areas including branch bark ridge and branch collars.
  - .2 Technique for selection process and pruning used to establish desired form and shape for [each species].
- .4 Acceptance of Work will be determined by PCA Representative from field sample.
- .5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Dispose of unused disinfectant at official hazardous material collections site approved by PCA Representative and Certified Arborist (CA).
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Divert wood materials from landfill to stockpiling areas for chipping as directed by PCA Representative.

**1.7 TOOL MAINTENANCE**

- .1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.
- .2 Disinfect tools before each tree is pruned.
- .3 On diseased plant material disinfect tools before each cut.

**Part 2 Products****2.1 DISINFECTANT**

- .1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

**Part 3      Execution****3.1      APPLICATION**

- .1      Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.2      GENERAL**

- .1      Prune in accordance with ANSI A300, and as directed by PCA Representative and Certified Arborist (CA). Where discrepancies occur between standard and specifications, specifications govern.
- .2      Notify immediately PCA Representative and Certified Arborist (CA) conditions detrimental to health of plant material or operations.
- .3      Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.
- .4      Prune each species when in full leaf.
- .5      Retain natural form and shape of plant species.
- .6      Do not:
  - .1      Flush cut branches.
  - .2      Crush or tear bark.
  - .3      Cut behind branch bark ridge.
  - .4      Damage branch collars.
  - .5      Damage branches to remain.

**3.3      PRUNING**

- .1      Remove dead, dying, diseased and weak growth from plant material where noted on plan to promote healthy growth.
- .2      Remove live branches that:
  - .1      Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
  - .2      Are of weak structure including narrow crotches.
  - .3      Obstruct development of more important branches.
  - .4      Are broken.
- .3      Remove live branches to re-establish natural species form including:
  - .1      One or more developing leaders.
  - .2      Multiple growth due to previous topping.
  - .3      Branches extending outward from natural form.
  - .4      Undesirable sucker growth.

- .4 Remove loose branches, twigs and other debris lodged in tree.
- .5 Remove vines.
- .6 For branches under 50 mm in diameter:
  - .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
  - .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
  - .3 Do not cut lead branches unless directed by PCA Representative and Certified Arborist (CA).
- .7 For branches greater than 50 mm in diameter:
  - .1 Make first cut on lower side of branch 305 mm from trunk, one third diameter of branch.
  - .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
  - .3 Make final cut adjacent to and outside branch collar.
- .8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.
  - .1 Repair areas which are damaged, or remove damaged area back to next branch collar.
- .9 Remove additional growth designated by PCA Representative and Certified Arborist (CA).

**3.4 ROOT GIRDLING**

- .1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.
- .2 Remove exposed portion of girdling root as directed by PCA Representative and Certified Arborist (CA) after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

**3.5 CARE OF WOUNDS**

- .1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

**3.6 CLEAN-UP**

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 Collect and chip pruned material and relocate to stockpile area as directed by PCA Representative
- .3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**3.7 CLOSEOUT ACTIVITIES**

- .1 Submit trees maintenance reports for review by PCA Representative and Certified Arborist (CA).

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 31 05 16 – Aggregate Materials

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .5 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M8, Sieves, Testing, Woven Wire, Metric.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 31 05 16 - Aggregate Materials.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Packaging Waste Management: Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

**Part 2 Products****2.1 MATERIALS**

- .1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

- .1 Crushed stone or gravel.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2 and CAN/CGSB-8.1.

**Part 3 Execution****3.1 PLACEMENT AND INSTALLATION**

- .1 Place granular base material after trail offset flags have been installed every 10m along entire length of trail clear zone by Contractor and accepted in writing by Consultant and PCA Representative.
- .2 Place granular base after subgrade surface is inspected and accepted by Consultant and PCA Representative.
- .3 Placing:
  - .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Begin spreading base material on crown line or on high side of one-way slope.
  - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
  - .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
  - .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .9 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .4 Compaction Equipment:
  - .1 Ensure compaction equipment is capable of obtaining required material densities.
  - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from PCA Representative before use.
  - .3 Equipped with device that records hours of actual work, not motor running hours.
- .5 Compacting:
  - .1 Compact to density not less than 100% maximum dry density to ASTM D698.

- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .3 Apply water as necessary during compacting to obtain specified density.
- .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by PCA Representative.
- .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

**3.2 SITE TOLERANCES**

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

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .2 Divert unused granular materials from landfill to local quarry facility as approved by PCA Representative.

**3.4 PROTECTION**

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by PCA Representative.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 45 00 – Quality Control
- .3 Section 01 73 00 - Execution

**1.2 MEASUREMENT AND PAYMENT**

- .1 Measure supply and erection of wire fence in metres erected.

**1.3 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM A121-[07], Standard Specification for Zinc-Coated (Galvanized) Steel Wire.
- .2 CSA Group (CSA)
  - .1 CSA G42-[1964 (R1998)], Galvanized (Zinc-Coated) Steel Farm-Field Wire Fencing.
  - .2 CAN/CSA O80 Series-[08], Wood Preservation.
  - .3 CAN/CSA-Z809-[08], Sustainable Forest Management.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for fencing, posts, and hardware, including product characteristics, performance criteria, physical size, finish and limitations in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Certificates: submit product certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

**1.5 QUALITY ASSURANCE**

- .1 Sustainable Standards Certification:
  - .1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal any packaging material for recycling.
- .4 Divert unused metal materials from landfill to approved metal recycling facility.

**1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect fence materials from damage.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products****2.1 POST AND WIRE FENCE**

- .1 Wire fence:
  - .1 Farm-field type: Minimum 8 wire page fence, 1.0m ht. to CSA G42 standard [748], high tensile 832-12-12 ½, class 1 galvanizing.
  - .2 Bracing Wire: 4 strands of 3.5mm dia. galvanized soft steel tensioned.
  - .3 Wire Strainer: Hot dip galvanized steel, Gallagher In-line Fence Strainer, ratchet type, model G79504, or approved equal.
  - .4 Wire Fence Fasteners: 4mm galvanized staples with driving length of 45mm minimum.
- .2 Timber components:
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Wire Fence Bracing Rails: 75mm dia. peeled Ontario white cedar, No.1 grade, 4.0m length.
- .3 Timber posts:
  - .1 Sound, seasoned wood, peeled Ontario white cedar with ends cut square or on a slant as indicated.
  - .2 Wire Fence Intermediate posts: 2.6 m long and 150 mm minimum diameter at small end.

- .3 Wire Fence Corner, end, and anchor posts: 2.6 m long and 200 mm minimum diameter at small end.

## 2.2 POST AND BOARD FENCE

- .1 Timber Components:
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Board Fence Rails: 150x25mm rough sawn Ontario white cedar, No.1 grade, lengths as indicated.
  - .3 Braces for end, corner and gate posts: [89 x 89] mm [3] m long.
  - .4 Cleats for anchoring corner, gate, end and anchor posts: [38 x 140 x 910] mm
- .2 Timber Posts:
  - .1 Board Fence posts: 2.4m long and 150 mm minimum diameter at small end.
  - .2 Short Board Fence posts: 2.05m long and 150 mm minimum diameter at small end.
  - .3 Straight, free from splits, shakes and excessive knots.
  - .4 Existing knots trimmed flush with surface.
  - .5 Posts to be treated in accordance with CAN/CSA O80 Series.
- .3 Hardware:
  - .1 Board Fasteners: 2 ½ inch coated deck screws.

## Part 3 Execution

### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

### 3.2 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate installation in accordance with manufacturer's written instructions.
  - .1 Inform PCA Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from PCA Representative.

### 3.3 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Grading:
  - .1 Level ground along fence line in order to ensure that bottom wire of fence between posts can be maintained at not more than 300 mm above ground for wildlife passage.

**3.4 ERECTION OF FENCE**

- .1 Stake out gate locations on site for review and approval by PCA Representative prior to installation. Ensure posts are located on Parks Canada property, and allow space for a car to safely park at bottom of parking lot driveway entrance to open gates.
- .2 Erect fence along lines as indicated and directed by PCA Representative.
- .3 Installation of wood posts:
  - .1 Do not excavate for post installation. Posts to be pounded securely into place.
  - .2 Space intermediate posts at 4 m on centre.
  - .3 Space corner, and end posts 4 m from adjacent post.
  - .4 Locate and erect gate posts as indicated.
  - .5 Install posts true to line and plumb with 1.4 m of post projecting above ground.
  - .6 Slant of post tops to be perpendicular to fence line and facing outward towards farm fields as indicated.
  - .7 Install cleats for anchoring at corner, gate, end and anchor posts as indicated.
  - .8 Install braces at end, and corner posts as indicated. Join braces into posts and spike securely.
  - .9 Erect wires and stretch to have uniform tension. Splice wires with standard wire splices.
  - .10 Attach top wires to posts with 2 staples minimum. Fasten other wires to posts and cross braces with at least two staples. Staple wires securely at end, anchor and gate posts.

**3.5 INSTALLATION OF GATES**

- .1 Install gates in locations as indicated.
- .2 Install gates to prevent over-stress on gate posts when gates are open.

- .1 Install on level ground with ground clearance of 300 mm maximum for wildlife passage.
- .2 Install as per manufacturer's installation instructions.

**3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Clean and trim areas disturbed by operations. Dispose of surplus material as directed by PCA Representative.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .2 Unused wood preservative material must be disposed of at an official hazardous material collections site as approved by the PCA Representative. Unused preservative material may not be disposed of into the sewer system, into streams, lakes, onto the ground or in other locations where they will pose a health or environmental hazard.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 32 11 23 – Aggregate Base Courses

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples:
  - .1 Submit limestone ledgerock sample for review and approval by PCA Representative, or arrange for the PCA Representative to approve the samples at the source in advance of the delivery to the site.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Stones delivered to site shall be stockpiled and handled in a manner that will prevent breakage or scarring.
- .2 All delivery of stone shall be coordinated by the Contractor with the supplier.

**1.4 NOTIFICATION**

- .1 Stone shall be approved by the PCA Representative in writing prior to its delivery to site.
- .2 Notify the PCA Representative ten (10) working days and again forty-eight (48) hours prior to commencing placement of any rock on site.

**Part 2 Products****2.1 MATERIALS**

- .1 Armourstone to conform to contract drawings:
  - .1 Armour stone shall be square cut natural quarried limestone ledgerock with a flat, weathered top surface.
  - .2 Exposed faces and ends shall be natural split faced and completely weathered and free of visible drill marks.
  - .3 All abutting sides to be natural split faced, joints/gaps not to exceed 25mm.
  - .4 Stones shall be of uniform thickness, rectangular in shape and approximately equal in size.
  - .5 Stone sizes shall be: 600 mm wide x 600 mm high x 1000 mm long.
  - .6 Colour: light grey, buff, brown.
  - .7 Supplier: Owen Sound Ledgerock or approved equal.
- .2 Granular base:

- .1 Granular 'A' in accordance with Section 32 11 23 – Aggregate Base Courses.
- .2 Granular 'B' in accordance with Section 32 11 23 – Aggregate Base Courses.

**Part 3 Execution****3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for armourstone installation.
  - .1 Visually inspect substrate in presence of PCA Representative.
  - .2 Inform PCA Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from PCA Representative.

**3.2 INSTALLATION**

- .1 Assemble furnishings in accordance with manufacturer's written recommendations.
- .2 Seat wall and decorative armourstone units shall be placed to the lines, levels and top elevations indicated on the drawings unless otherwise directed by the PCA Representative. The plans do not intend to show exact stone placement but do specify elevations to be met.
- .3 The armourstone grouping shall achieve a uniform, horizontal/level and with architectural appearance. Saw cut or chisel stone to achieve a tight fit between armourstones.
- .4 Armourstone shall be placed level with a tolerance of 5mm off of level across each stone.
- .5 Gap between units shall not be more than 25mm.
- .6 The Contractor shall layout the stone for approval by the PCA Representative prior to setting into grade and backfilling.
- .7 Contractor shall provide a minimum of two (2) experienced and qualified staff for all phases of the stonework.
- .8 Material damaged by the Contractor during installation, as determined by the PCA Representative, shall be removed and replaced by the Contractor at no additional cost to PCA.
- .9 Stone shall be machine placed by use of belts and chains or an approved alternate method. Stone shall not be dumped or pushed into place.

- .10 The placement and the overall uniform appearance of the stone is critical. The Contractor may be required to remove or reset stones at his own expense in order to obtain an appearance satisfactory to the PCA Representative.
- .11 Have the granular base compacted and tested by a third-party testing agency.
- .12 Stones damaged during installation or transportation shall be disposed of and replaced with new ones at the Contractor's expense, unless otherwise directed by the PCA Representative.
- .13 The Contractor shall be responsible for any damage made to existing adjacent surfaces during construction and the placement of stone.
- .14 Prevent soiling, chipping or defacing of material.
- .15 Place stone in depths and arrangements to ensure material and equipment below is non-visible.
- .16 No sawcut or guillotined side shall be exposed to view.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 EXCESS MATERIAL**

- .1 The Contractor shall be responsible for removing excess stone from site at no additional cost to PCA. The PCA Representative shall determine if stone is in excess.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00 – Cast-in-Place Concrete

**1.2 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA-Z809-[08], Sustainable Forest Management.
- .2 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-[2004], FSC Principle and Criteria for Forest Stewardship.
- .3 Sustainable Forestry Initiative (SFI)
  - .1 SFI-[2010-2014] Standard.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's instructions, printed product literature and data sheets for furniture and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit shop drawings indicating dimensions, quantity, sizes, assembly, anchorage/hardware and installation details for each furnishing specified.
- .4 Samples:
  - .1 Submit colour chip sample for review and approval prior to fabrication.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.5 QUALITY ASSURANCE**

- .1 Sustainable Standards Certification:
  - .1 Certified Wood: Provide listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect furnishings from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and recycling as specified in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**Part 2 Products****2.1 CUSTOM WOOD BENCH**

- .1 Seat: Constructed from natural hardwood logs. Minimum 600mm diameter, plane log in half lengthwise, 1.8m length.
- .2 Supports: Constructed from natural hardwood logs. Minimum 350mm diameter, plane ¼ of log lengthwise, 0.8m length, 2 supports per bench.
- .3 Anchor: 15M rebar minimum 1.45m in length.
- .4 Preparation: Prepare logs by removing all externally loose debris.
- .5 Installation: Notch underside of seat at support log locations. Drill through centre of support logs when laid horizontally, and midway through bottom of seat log for installation of anchoring rebar. Anchor rebar minimum 1.0m into ground. Ensure seat sits level, and is anchored and firmly supported with no movement.
- .6 Contractor to select logs for bench and allow for review and approval by PCA Representative prior to fabrication, either at the source or on site.
- .7 Contractor to stake out locations for seating nodes on site for review and approval by PCA Representative prior to installation.

**2.2 TRASH CONTAINER AND RECYCLE CONTAINERS**

- .1 Manufacturer: Molok North America Ltd.
- .2 Product: Molok Classic supplied by PCA
- .3 Model: M-1300
- .4 Size: 1300 Litre
- .5 Installation: Complete System Installation as per manufacturer's instructions, including all anchoring hardware and backfill materials.
- .6 Contractor to provide product data, and shop drawings for review and approval by PCA Representative prior to fabrication.

**2.3 REMOVABLE BOLLARDS**

- .1 Manufacturer: Maglin Site Furniture or approved equal
- .2 Product: Removable lockable bollard
- .3 Model: MBO-0650-00013 with Type 4 removable direct burial base
- .4 Size: 197mm diameter, 841 mm height.
- .5 Material: H.S. steel tube
- .6 Colour/Finish: Custom Parks Canada Heritage Green (Pantone 553 or RAL 6028) powdercoat finish
- .7 Accessories: Complete with locking mechanism and key, and white reflective tape (2 strips)
- .8 Installation: As per manufacturer's instructions.
- .9 Location: 0.5m offset from edge of boardwalks on either end, and where indicated on plans.
- .10 Contractor to provide product data, colour chip sample, and shop drawings for site furniture and concrete footing design for review and approval by PCA Representative prior to fabrication.

**2.4 OFFSET P-GATES (PAIR)**

- .1 Manufacturer: Maglin Site Furniture or approved equal
- .2 Product: Removable bollard swing gate
- .3 Model: MMP-0650-00004 with Type 4 removable direct burial base
- .4 Size: 60" arm length
- .5 Material: H.S. Steel tube
- .6 Colour/Finish: Custom Parks Canada Heritage Green (Pantone 553 or RAL 6028) powdercoat finish
- .7 Accessories: Complete with locking mechanism and key, and white reflective tape (2 strips)
- .8 Installation: As per manufacturer's instructions.
- .9 Contractor to provide product data, colour chip sample, and shop drawings for site furniture and concrete footing design for review and approval by PCA Representative prior to fabrication.

**2.5 FARM CHAIN CLOSURE**

- .1 Galvanized steel chain plate staple, 50x50mm x 6mm thick square plate. Install as per manufacturer's installation instructions. All hardware to be galvanized steel and vandal resistant.
- .2 Galvanized bollard security chain with padlock and key. Locking mechanism hardware to be galvanized.

- .3 Gate posts for chain closures: 2.6m long and 200x200 mm minimum square, rough sawn Ontario white cedar, No.1 grade, sound, seasoned wood with ends cut square or on a slant as indicated.
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Straight, free from splits, shakes and excessive knots.
  - .3 Posts to be treated in accordance with CAN/CSA O80 Series.

**2.6 FARM GATES**

- .1 Manufacturer: TSC Country or approved equal
- .2 Product: 20' Diamond 7 Bar 57" Gate with wheel
- .3 Size: 6m (20') wide x 1.5m ht.
- .4 Material: H.S. Steel
- .5 Colour: Custom Parks Canada Heritage Green (Pantone 553 or RAL 6028) powdercoat finish
- .6 Accessories: Complete with wheel and diamond bar chain latch with padlock and key. Locking mechanism hardware to be galvanized.
- .7 Install using heavy duty GHA galvanized hardware as per manufacturer's instructions.
- .8 Contractor to provide product data, colour chip sample, and shop drawings for review and approval by PCA Representative prior to fabrication.
- .9 Gate posts for farm gates: 3.0m long and 200x200 mm minimum square, rough sawn Ontario white cedar, No.1 grade, sound, seasoned wood with ends cut square.
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Straight, free from splits, shakes and excessive knots.
  - .3 Posts to be treated in accordance with CAN/CSA O80 Series.

**2.7 DOUBLE FARM GATES**

- .1 Manufacturer: TSC Country or approved equal
- .2 Product: (2) 18' Diamond Bar Gate with wheel
- .3 Size: 5.49m (18') wide x 1.2m ht.
- .4 Material: H.S. Steel
- .5 Colour: Custom Parks Canada Heritage Green (Pantone 553 or RAL 6028) powdercoat finish
- .6 Accessories: Complete with one wheel for each gate, and welded diamond bar chain latch with padlock and key. Locking mechanism hardware to be galvanized.
- .7 Install using heavy duty GHA galvanized hardware as per manufacturer's instructions.

- .8 Contractor to provide product data, colour chip sample, and shop drawings for review and approval by PCA Representative prior to fabrication.
- .9 Gate posts for double farm gates: 2.7m long and 200x200 mm minimum square, rough sawn Ontario white cedar, No.1 grade, sound, seasoned wood with ends cut square or on a slant as indicated.
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Straight, free from splits, shakes and excessive knots.
  - .3 Posts to be treated in accordance with CAN/CSA O80 Series.

## 2.8 WOOD GUARDRAIL

- .1 Wood components:
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Straight, free from splits, shakes and excessive knots.
  - .3 Existing knots trimmed flush with surface.
  - .4 Posts to be treated in accordance with CAN/CSA O80 Series.
- .2 Posts: 100x100mm square rough sawn Ontario white cedar, No.1 grade, lengths as indicated.
- .3 Boards: 100x50mm and 50x50mm rough sawn Ontario white cedar, No.1 grade, lengths as indicated.
- .4 Guardrail Mesh: black vinyl coated wire, 11 gauge, 2x4" mesh, supplied by Louis E. Page Inc. or approved equal.
- .5 All hardware to be galvanized steel and vandal resistant.
- .6 Post Base: 100x100mm square post base, Simpson StrongTie E-Z Base, galvanized post base, powdercoated black, with Strong-Drive SDS heavy duty anchor bolts as indicated, or approved equal.

## 2.9 WOOD POSTS FOR SIGNAGE

- .1 Farm Access Signage Posts: 2.6m long and 150mm dia. minimum, sound, seasoned wood, peeled Ontario white cedar with ends cut on a slant as indicated.
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Straight, free from splits, shakes and excessive knots.
  - .3 Existing knots trimmed flush with surface.
  - .4 Posts to be treated in accordance with CAN/CSA O80 Series.
- .2 Directional Signage Posts: 3.7m long and 150x150mm square rough sawn Ontario white cedar, No.1 grade.
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
  - .2 Straight, free from splits, shakes and excessive knots.
  - .3 Posts to be treated in accordance with CAN/CSA O80 Series.

**2.10 BIKE RACKS**

- .1 Manufacturer: Landscape Forms Inc. or approved equal
- .2 Model: Loop bike rack
- .3 Size: 36" length, 31" height.
- .4 Material: Aluminum
- .5 Colour/Finish: Low Sheen Architectural powdercoat finish in Nutmeg
- .6 Installation: Surface mounted onto concrete pad as per manufacturer's instructions.
- .7 Location: Minimum 0.8m offset from walls or edges as per Landscape Forms Spacing Guidelines document, and where indicated on plans.
- .8 Contractor to provide product data, colour chip sample, and shop drawings for site furniture and concrete slab design for review and approval by PCA Representative prior to fabrication.

**2.11 EXAMINATION**

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

**2.12 PREPARATION**

- .1 Locate and protect utility lines.
- .2 Notify and acquire written acknowledgement from utility authorities before beginning installation Work.

**2.13 INSTALLATION**

- .1 Assemble furnishings in accordance with manufacturer's written recommendations.
- .2 Install furnishings true, plumb, anchored and firmly supported, as directed by PCA Representative.
- .3 Touch-up damaged finishes to approval of PCA Representative.

**2.14 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**2.15 PROTECTION**

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

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 32 92 19.13 – Mechanical Seeding

**1.2 REFERENCE STANDARDS**

- .1 Agriculture and Agri-Food Canada
  - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment (CCME)
  - .1 PN1340-[2005], Guidelines for Compost Quality.
- .3 United States Environmental Protection Agency (EPA), Office of Water
  - .1 EPA-833-R-06-004, Developing Your Stormwater Pollution Prevention Plan, A Guide for Construction Sites
- .4 Canadian Society of Landscape Architects (CSLA)/Canadian Nursery Landscape Association (CNLA)
  - .1 Canadian Landscape Standard [2016], First Edition
  - .2 Canadian Nursery Stock Standard [2017], Ninth Edition

**1.3 DEFINITIONS**

- .1 Topsoil:
  - .1 Mixture of soil and decomposing organic matter excavated on site for trail preparation, seeding and tree/vegetation planting.
  - .2 Imported mixture of soil is permitted only where needed to achieve grading indicated on drawings. This imported soil shall be heat-treated prior to arrival on site in order to be weed free. It shall be composed of sand, silt, clay, and decomposing organic matter, suitable as a growing medium for native species and free from toxic or growth inhibiting contaminants.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.5 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products****2.1 TOPSOIL**

- .1 Topsoil for seeded areas: Contractor to use existing materials stripped and stockpiled from the site prior to grading works. No amendments are required. Contractor is required to ensure the soil is free of non-organic debris.
- .2 Imported Topsoil: Heat-treated mixture of 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 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
  - .2 Contain no toxic elements or growth inhibiting materials.
  - .3 Finished surface free from:
    - .1 Debris and stones over 50 mm diameter.
    - .2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .4 Consistency: friable when moist.

**2.2 SOIL AMENDMENTS**

- .1 Applies only to imported topsoil should any be required.
- .2 Sand: washed coarse silica sand, medium to coarse textured.
- .3 Organic matter: compost Category in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .4 Limestone:
  - .1 Ground agricultural limestone.
  - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

- .5 Use industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

**2.3 SOURCE QUALITY CONTROL**

- .1 Advise PCA Representative of sources of imported topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to imported soil(s) as specified.
- .3 Conduct soil testing by recognized testing facility for pH, Nitrogen (N), Phosphorous (P), and Potassium (K), and organic matter.
- .4 Carry out testing of topsoil by testing laboratory designated by PCA Representative.
  - .1 Perform soil sampling, testing and analysis in accordance with applicable Provincial standards.

**Part 3 Execution****3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

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

**3.2 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as directed by PCA Representative after area has been cleared of trees, brush, stumps, invasive and noxious plants and their reproductive parts, rocks 100 mm and over, and tall herbaceous plants and removed from site.
- .2 Strip topsoil to depths as indicated.
  - .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile in locations as indicated on drawings and directed by PCA Representative.
  - .1 Stockpile height not to exceed 2 m.
  - .2 Protect stockpile from adverse weather conditions, contamination from invasive plant material, and compaction.

- .3 Avoid placing stockpile in low areas where natural drainage or storm water could pond, or erode these materials during inclement weather.
- .4 All stripped topsoil and excavated material is to remain on site, as directed by the PCA Representative.

**3.3 PREPARATION OF EXISTING GRADE**

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

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

- .1 Place topsoil after PCA Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 Spread topsoil as indicated on the drawings to the noted minimum depths after
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.
- .5 Avoid spreading or grading in wet, frozen, or saturated state.

**3.5 FINISH GRADING**

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

**3.6 ACCEPTANCE**

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

**3.7 SURPLUS MATERIAL**

- .1 Dispose of surplus materials except topsoil not required where directed by PCA Representative.

**3.8 CLEANING**

- .1 Proceed with cleaning in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area organized and tidy at end of each day.
  - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Upon completion remove surplus materials, rubbish, tools and equipment.
  - .1 Clean and reinstate areas affected by Work.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at an appropriate facility.
  - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by PCA Representative.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 32 91 19.13 – Topsoil Placement and Grading

**1.2 REFERENCE STANDARDS**

- .1 Canadian Society of Landscape Architects (CSLA)/Canadian Nursery Landscape Association (CNLA)
  - .1 Canadian Landscape Standard [2016], First Edition
  - .2 Canadian Nursery Stock Standard [2017], Ninth Edition.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for seed.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

**1.4 QUALITY ASSURANCE**

- .1 Qualifications: Provide proof of qualifications when requested by PCA Representative.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Labelled bags of seed identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
- .3 Storage and Handling Requirements:
  - .1 Store seed in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

**1.6 WARRANTY**

- .1 For seeding, 12 months warranty period is extended to 24 months.

- .2 Contractor hereby warrants that seeding will remain free of defects for 24 months.
- .3 End-of-warranty inspection will be conducted by PCA Representative.

**Part 2 Products****2.1 SEED**

- .1 Canada "Certified" seed, in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
  - .1 Mixture compositions as indicated on drawings.
- .2 In packages individually labelled in accordance with "Seeds Regulations" and indicating name of supplier.

**2.2 WATER**

- .1 Free of impurities that would inhibit germination and growth.
- .2 Supplied by Contractor at designated source.

**Part 3 Execution****3.1 EXAMINATION**

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

**3.2 SEED BED PREPARATION**

- .1 Do not perform work under adverse field conditions as determined by PCA Representative.
- .2 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3 Verify that grades are correct. If discrepancies occur, notify PCA Representative and commence work when instructed by PCA Representative.
- .4 Fine grade surface free of humps and hollows to smooth, even grade, to tolerance of plus or minus 25 mm, surface draining naturally.

- .5 Cultivate fine graded surface approved by PCA Representative to 25 mm depth immediately before seeding.

**3.3 SEED PLACEMENT**

- .1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.
- .2 For mechanical seeding:
  - .1 Mechanical landscape drill seeder ("Brillion" type or equivalent) which accurately places seed at specified depth and rate and rolls in single operation.
  - .2 Use equipment and method acceptable to PCA Representative.
- .3 For manual seeding:
  - .1 Use manually operated drop seeder ("Cyclone" type or equivalent).
  - .2 Use manually operated, water ballast, landscaping type, smooth steel drum roller. Ballast as directed by PCA Representative.
  - .3 Use equipment and method acceptable to PCA Representative.
- .4 On cultivated surfaces, refer to drawings for seed sowing rates.
- .5 Blend applications into adjacent grass/meadow/wetland/woodland areas to form uniform surfaces.
- .6 Sow half of required amount of seed in one direction and remainder at right angles as applicable.
- .7 Incorporate seed by light raking in cross directions.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
  - .1 Clean and reinstate areas affected by Work.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of seed application until acceptance by PCA Representative:

- .1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
- .2 Repair and reseed dead or bare spots to allow establishment of seed before acceptance.

**3.6 FINAL ACCEPTANCE**

- .1 PCA Representative will accept seeded areas provided that:
  - .1 Areas are uniformly established free of rutted, eroded, bare or dead spots and extent of weeds apparent in grass is acceptable.
- .2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

**3.7 MAINTENANCE DURING WARRANTY PERIOD**

- .1 Perform following operations from time of acceptance until end of warranty period.
  - .1 Repair and reseed dead or bare spots to satisfaction of PCA Representative.

**END OF SECTION**

**Solicitation No. 5P201-20-0104**

**North East Trail: Rouge National Urban Park  
Parks Canada**

# **APPENDIX A**

## **Geotechnical Report**



**THURBER** ENGINEERING LTD.

**FINAL  
PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT  
TRAIL DESIGN ON NORTH EASTERN AREA LANDS  
ROUGE NATIONAL URBAN PARK  
DURHAM REGION (PICKERING AND UXBRIDGE TOWNSHIPS), ONTARIO**

**Report**

to

**Dillon Consulting Limited**

Date: February 4, 2021  
File: 28522



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## **APPENDICES**

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Appendix B	Borehole Location Plans
Appendix C	Geotechnical Laboratory Soil Test Results
Appendix D	Laboratory Certificate of Analysis – Soil Aggressiveness
Appendix E	Laboratory Certificate of Analysis – Soil Management



## 1. INTRODUCTION

This report presents the results of a preliminary geotechnical investigation conducted for the trail route design for the North Eastern Area lands in Rouge National Urban Park, located in Durham Region-Pickering and Uxbridge Township, north of Concession Road 8, Ontario.

Based on the revised Terms of Reference (TOR) documents dated April 21, 2020, we understand that Dillon has been retained by Parks Canada to complete the trail route design and prepare construction documents for the North Eastern (NE) Area lands in Rouge National Urban Park (RNUP), located in Durham Region-Pickering and Uxbridge Township, north of Concession Road 8. It is understood that potential structures, including boardwalks (in wetland, or partially saturated areas), stairs, and shade structures are proposed along the proposed trail route. It is also understood that raised granular trails may be constructed in place of potential boardwalks.

The purpose of the investigation was to explore the subsurface conditions at the specific locations requested and based on the data obtained, to provide borehole logs, borehole location plans, a written description of the subsurface conditions, and geotechnical recommendations regarding foundations for the proposed structures, trail route design, the environmental quality of the soils, and other construction concerns.

Thurber Engineering Ltd. (Thurber) carried out the investigation as a sub-consultant to Dillon Consulting Limited (Dillon) who has been retained by Parks Canada to complete the trail route design.

*It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.*

## 2. BACKGROUND INFORMATION

### 2.1 Site Description

The NE area of the RNUP project area extends about 6 km north and 2 km east through farmland and forested areas from the intersection of Durham Regional Road 8 and Sideline 34 to the intersection of Webb Road and Concession Road 2. The northern most section of the project area is an existing trail "Coyote Trail", part of the existing RNUP system.



The farmland within the project site is mainly used for crop farming of corn and soybean. The forested area is dense mature forest with various trees and underbrush. Low-lying wetlands and swampy areas are located throughout the proposed trail alignment.

The proposed trail crosses West Duffins Creek and/or its tributaries at numerous locations along the alignment.

## 2.2 Geology

Based on the information in *The Physiography of Southern Ontario*<sup>1</sup> by Chapman and Putnam (1984), the site is located within the South Slope physiographic region. The South Slope is characterized by low-lying, fine-grained, undulating ground moraine and knolls

Based on *Surficial Geology of Southern Ontario*<sup>2</sup> and *Quaternary Geology Map P2204*<sup>3</sup>, the surficial material of the South Slope in the vicinity of the site is composed of clay and silt till where the materials may have been derived from a glaciolacustrine environment or from the shale bedrock. Ice contact stratified deposits of sand and gravel with minor silt, clay and till are located on the northeast corner of the project limits. Pockets of modern alluvial deposits comprised of clay, silt, sand, gravel and may contain organic remains are noted within the vicinity of the study area near existing creeks.

According to *Paleozoic Geology of Southern Ontario*<sup>4</sup>, the site's bedrock is comprised of the Blue Mountain Formation. The unit is composed of shale and minor limestone. The bedrock depth is variable due to the undulating topography, however, it is expected to be greater than 40 meters below ground surface.

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<sup>1</sup> Chapman, L.J. and Putnam, D.F. 1984. The Physiography of Southern Ontario, Ontario Geological Survey Special Volume 2, Third Edition. Accompanied by Map P.2715, Scale 1:600,000.

<sup>2</sup> Ontario Geological Survey, 2010: Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV

<sup>3</sup> Sharpe, D. R., 1980: Quaternary Geology of Toronto and Surrounding Area; Ontario Geological Survey Preliminary Map P. 2204, Geological Series. Scale 1:100 000. Compiled 1980

<sup>4</sup> Armstrong, D.K. and Dodge, J.E.P., 2007: Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219.



### 3. INVESTIGATION PROCEDURES

#### 3.1 Field Investigation

The field investigation for this project was carried out on July 17 and between September 9 to 25, 2020 and comprised a total of 13 boreholes (Boreholes SC-1, SC-2A, SC-2B, SC-4A, SC-4B, BW1 to BW4, BW6, BW-7A, BW-7B and SS1) advanced to depths ranging from 1.9 to 9.5 m. Borehole details are provided in Table 3.1 and in the Record of Borehole sheets included in Appendix A. The approximate locations of the boreholes are shown on the Borehole Location Plans, Drawings 28522-1 to 28522-2, provided in Appendix B.

**Table 3.1 – Borehole Details**

Facility	Borehole No.	Approx. Ground Elevation (m)	Borehole Termination Depth (m)	Approx. Borehole Termination Elevation (m)
Boardwalks	BW-1	235.3	4.9	230.4
	BW-2	242.1	3.0	239.1
	BW-3	265.2	2.7	262.5
	BW-4	264.6	3.0	261.6
	BW-6	285.2	4.3	280.9
	BW-7A	262.3	1.9	260.4
	BW-7B	262.0 <sup>1</sup>	6.7	255.3 <sup>1</sup>
Stair Structures	SC-1	232.5	4.9	227.6
	SC-2A	268.7	2.4	266.3
	SC-2B	266.4	5.2	261.2
	SC-4A	287.4	2.7	284.7
	SC-4B	282.0 <sup>1</sup>	2.9	279.1 <sup>1</sup>
Shade Structure	SS-1	294.3	9.4	284.9

**Note:**

1. Boreholes SC-4B and BW-7B were not surveyed due to poor GPS reception caused by tree cover. The elevations and GPS coordinates for these boreholes were based on Topographic and GIS Mapping systems. The elevations should not be relied upon for design. The foundation level recommendations will be based on depths below ground surface, not on geodetic elevations.
2. Boreholes BW-5 and SC-3 were not advanced by direction of the client.

The borehole locations and ground surface elevations were established in the field by a Thurber representative using a portable GPS receiver (Trimble R10), with the exception of Boreholes BW-7B and SC-4B as noted above, and/or verified relative to existing site features.



All borehole locations were cleared of utilities prior to commencement of drilling. The boreholes were repositioned as necessary in consideration of surface features, underground utilities, and restricted site access.

Due to the limited access conditions of the borehole locations, Boreholes BW-1, BW-2, BW-3, BW-4, BW-6, BW-7A, SC-1, SC-2A SC-4A and SC-4B were advanced by driving continuous split spoons using portable tripod with a full weighted hammer supplied and operated by OGS Inc. Boreholes SC-2B, SS-1 and BW-7B were advanced using hollow stem augers powered by a Mobile B-57 rubber track drill rig supplied and operated by Landshark Drilling Inc.

Soil samples were obtained at selected intervals using a 50 mm outside diameter spit-spoon sampler driven in conjunction with the SPT.

The field investigation was carried out under the full-time supervision of Thurber technical staff. All boreholes were logged in the field. Soil sampled were identified, placed in labelled containers, and transported back to Thurber's laboratory in Oakville for further examination and testing.

Groundwater conditions were observed in the open boreholes throughout the drilling operations. Monitoring wells were installed in Boreholes BW-1, BW-2, BW-3, BW-4, BW-6 and BW-7B to permit monitoring of the groundwater levels at the site. The monitoring wells consisted of 32 mm or 50 mm diameter PVC pipe with a slotted screen sealed at a selected depth within the borehole. The installation details are summarized in Table 3.2 below.

**Table 3.2 – Monitoring Well Details**

Borehole/ Monitoring Well (BH/MW) No.	Ground Elevation (m)	Monitoring Well Tip		Slotted Screen Length (m)	Mid- Screen Depth (m)	Mid- Screen Elev. (m)
		Depth (m)	Elevation (m)			
BW-1	235.3	2.3	233.0	1.5	1.6	233.7
BW-2	242.1	3.0	239.1	1.5	2.3	239.8
BW-3	265.2	2.7	262.5	1.5	2.0	263.2
BW-4	264.6	1.6	263.0	0.8	1.2	263.4
BW-6	285.2	2.4	282.8	1.5	1.7	283.5
BW-7B	262.0	6.7	255.3	3.0	5.2	256.8

The boreholes in which no monitoring wells were installed were backfilled in general accordance with Ontario Regulation 903.



## **3.2 LABORATORY TESTING**

### **3.2.1 Geotechnical**

Geotechnical laboratory testing was carried out at Thurber's laboratory. All recovered soil samples were subjected to visual identification and to natural moisture content determination. Selected samples were also subjected to grain size distribution analysis (hydrometer and/or sieve) and Atterberg Limits testing, where appropriate. Laboratory testing results are summarized on the Record of Borehole sheets included in Appendix A and are presented on the figures included in Appendix C.

Selected soil samples were also submitted for analytical testing to assess the corrosion potential of the soil to ductile iron and the potential for sulphate attack on subsurface concrete structures. The analyses were carried out by SGS Canada Inc. (SGS) laboratories, an independent Canadian Association for Laboratory Accreditation (CALA) accredited laboratory. The results of the analytical testing are summarized in Section 5 below and are presented in Appendix D.

### **3.2.2 Geoenvironmental**

For preliminary evaluation of the environmental quality of the on-site soils, representative samples recovered from a selected borehole were submitted to Bureau Veritas Laboratories (BV), an independent Canadian Association for Laboratory Accreditation (CALA) accredited laboratory, for analytical testing of metals and inorganic parameters and petroleum hydrocarbons (PHC) Fractions F1 to F4, including benzene, ethylbenzene, toluene and xylenes (BTEX) and volatile organic compounds (VOCs) in accordance with O. Reg. 153/04. The results of the chemical laboratory testing are presented on the laboratory certificates of analysis in Appendix E.

## **4. DESCRIPTION OF SUBSURFACE CONDITIONS**

A generalized description of the subsurface conditions encountered in the boreholes is given in the following sections. Detailed descriptions of the soil conditions at the specific locations drilled are presented on the Record of Borehole sheets in Appendix A and take precedence over the generalized description. It should be recognized and expected that soil conditions will vary between and beyond borehole locations.

The subsurface stratigraphy encountered in the boreholes generally comprised of surficial topsoil, overlying deposits of fill and organic and alluvial deposits, underlain by native deposits of silty clay, clayey silt, sand and silt, overlying cohesive and non-cohesive till deposits. Further descriptions of the individual strata are presented below.



#### **4.1 Topsoil**

In Boreholes BW-1 to BW-4, BW-7A, BW-7B, SC-1A, SC-2A, SC-2B, SC-4A and SC-4B, a 100 to 610 mm thick surficial topsoil/topsoil fill layer was encountered. The topsoil contained varying levels of organic materials. The topsoil thickness will vary between and beyond the borehole locations, and the reported thickness is not meant to be used for estimating quantities.

A buried 100 mm thick layer of topsoil fill was contacted in Borehole SC-2B within a fill layer at a depth of 0.7 m.

#### **4.2 Fill**

Fill was encountered below the topsoil fill in Boreholes BW-7A, BW-7B, SC-2A and SC-2B, and at the ground surface of Borehole SS-1. In Boreholes BW-7B, SC-2B and SS-1 and the fill layer was 1.9 to 2.5 m thick and was penetrated at depths of 2.2 to 2.7 m (Elev. 259.8 to 292.1). Boreholes SC-2A and BW-7A were terminated within the fill at depths of 2.4 and 1.9 m (Elev. 266.3 and 260.5) upon practical refusal to advance. The fill was variable and comprised silty clay, silt, sand and gravel, and sand and contained concrete fragments and topsoil layers.

SPT 'N' values of 4 blows per 0.3 m of penetration to 75 blows for 25 mm of penetration were recorded in the fill, indicating a firm/loose to hard/very dense condition. Moisture contents of 2 to 25% were measured.

The results of grain size distribution analyses carried out on a selected sample of the silty clay fill is shown on Figure C1 in Appendix C. The results indicated 0% gravel, 12% sand, 35% silt and 53% clay sized particles.

#### **4.3 Organic and Alluvial Deposits**

Locally, in Borehole BW-6, an organic silt layer was contacted at the ground surface and was penetrated at a depth of 1.8 m (Elev. 283.4). SPT 'N' values of 1 to 25 blows per 0.3 m of penetration were recorded in the organic silt layer, indicating a very loose to compact condition. Moisture contents ranged from 148% to 233%.

A 0.5 and 0.6 m thick layer of alluvial silt was encountered below the surficial topsoil and was penetrated at 0.7 and 1.2 m (Elev. 241.5 and 286.2) in Boreholes BW-2 and SC-2A, respectively. The alluvial silt was loose with SPT 'N' values of 8 and 9 blows per 0.3 m of penetration. Moisture contents of 7% and 12% were measured.



#### 4.4 Sand to Silt and Sand

In Boreholes BW-1 and BW-4, a 1.2 and 0.6 m thick sand to silt and sand layer was contacted below the topsoil and was penetrated at depths of 1.8 and 0.9 m (Elev. 233.5 and 263.7). Moisture contents of the sand to silt and sand ranged from 19% to 24%. SPT 'N' values of 2 to 46 blows per 0.3 m of penetration were recorded in the sand to silt and sand stratum, indicating a very loose to dense condition.

#### 4.5 Silty Clay to Clayey Silt

A layer of silty clay to clayey silt was encountered below the fill, silt and sand, and alluvial silt at depths of 0.7 to 2.2 m (Elev. 233.5 to 292.1) in Boreholes BW-1, BW-2, and SS-1. The silty clay to clayey silt layer was penetrated at 2.4 and 2.3 m (Elev. 232.8 and 239.9) in Boreholes BW-1 and BW-2 and was penetrated at a depth of 7.2 m (Elev. 287.2) in Borehole SS-1. SPT 'N' values of 6 to 32 blows per 0.3 m of penetration were recorded, indicating a consistency of firm to hard. Moisture contents of 10 to 26% were measured.

The results of grain size distribution analyses carried out on selected samples of the silty clay are shown on Figure C2 in Appendix C. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0
Sand	2 to 23
Silt	41 to 79
Clay	18 to 42

Atterberg limits testing carried out on samples of the silty clay measured a plastic limit, liquid limit and plasticity index of 13 to 17, 25 to 29, and 8 to 14, respectively. These results, which are plotted on Figure C5 in Appendix C, indicate that the samples tested consists of low plasticity silty clay (CL).

#### 4.6 Silt

Locally, in Borehole SS-1, a sandy silt layer was contacted below the silty clay to clayey silt at a depth of 7.2 m (Elev. 287.2) and was penetrated at a depth of 7.8 m (Elev. 286.5). It is noted that a 0.4 m thick gravel layer was observed below the silt and was penetrated at a depth of 8.2 m (Elev. 286.1).



#### 4.7 Till Deposits

Plastic till deposits were contacted in Boreholes SC-1, BW-2, and BW-7B and non-plastic till deposits were contacted in Boreholes SC-1, SC-2B, SC-4A, SC-4B, SS-1, BW-1, BW-3, BW-4, and BW-6 below the topsoil, fill, alluvial silt, organic silt, and clay at depths of 0.6 to 8.2 m (Elev. 231.9 to 286.1). The till deposits extended to the termination depths of 2.7 to 9.4 m (Elev. 227.6 to 284.9).

SPT 'N' values recorded in the till deposits ranged from 13 blows per 0.3 m of penetration to 75 blows for 25 mm of penetration. In general, the 'N' values indicate a compact/stiff to very dense/hard condition. Measured moisture contents ranged from 4 to 23%.

The results of grain size distribution analyses carried out on selected samples of the non-plastic and plastic till deposits are shown on Figures C3 and C4, respectively, in Appendix C. The results of the grain size distribution analyses are summarized below:

Soil Particle	Non-Plastic Till	Plastic Till
Gravel %	1 to 12	1 to 3
Sand %	43 to 87	23 to 31
Silt %	10 to 40	35 to 58
Clay %	2 to 5	18 to 31

Atterberg limits testing carried out on a sample of the silty clay till measured a plastic limit, liquid limit and plasticity index of 14, 29 and 15, respectively. These results, which are plotted on Figure C5 in Appendix C, indicate that the sample tested consists of low plasticity silty clay (CL).

Till soils frequently contain cobbles and boulders, and these should be anticipated when excavating during construction.

#### 4.8 Groundwater Levels

During drilling, wet conditions were noted in the surficial materials in Boreholes BW-1, BW-2, BW-3, BW-4, BW-6 and BW-7, at approximate depths ranging from 0.0 to 1.9 m.

The groundwater depths and elevations measured in the monitoring wells installed in the boreholes are summarized in Table 4.1.

**Table 4.1 – Summary of Groundwater Level Observations**

BH/MW No.	Ground Elev. (m)	Mid-Screen Depth (m)	Mid-Screen Elev. (m)	Ground Water Elevation (metres below ground surface)
				October 30, 2020
BW-1	235.3	1.6	233.7	234.6 (0.7)
BW-2	242.1	2.3	239.8	241.9 (0.2)
BW-3	265.2	2.0	263.2	Dry
BW-4	264.6	1.2	263.4	264.6 (0.0)
BW-6	285.2	1.7	283.5	284.9 (0.3)
BW-7B	262.0	5.2	256.8	260.9 (1.1)

The above groundwater level measurements are short-term observations and seasonal fluctuations of the groundwater level are to be expected. Further, groundwater levels may be higher after prolonged periods of precipitation.

## **5. ANALYTICAL LABORATORY TESTING RESULTS**

### **5.1 Geotechnical**

Samples of the soils were submitted for analytical testing of corrosivity parameters and sulphate. The results of the analytical tests are shown in Table 5.1. The laboratory certificates of analysis are presented in Appendix D.

**Table 5.1 – Analytical Corrosivity Test Results**

Sample ID	Depth (m)	Description	Sulphide (%)	Chloride (µg/g)	Sulphate (µg/g)	pH	Resistivity (ohm.cm)	Redox Potential (mV)
SS-1 SS4	2.3-2.9	Silty Clay/Clayey Silt	<0.04	13	11	8.83	10000	307
BW-1 SS2	0.6-1.2	Silt and Sand	<0.04	6.6	33	8.75	6540	246



## 5.2 Geoenvironmental

Based on the conditions encountered during the investigation, it is anticipated that the soils excavated during potential trail construction works will primarily comprise existing fill materials and native overburden. In general, no visual and olfactory indications of impact were observed in the soil samples recovered during the geotechnical field investigation program, with the exception of two samples in Borehole BW-7B (BH BW-7B SS2 and SS3), which had hydrocarbon odours.

The two soil samples with olfactory indications of potential contamination were submitted for analytical laboratory testing. The sample locations and material types that were selected for analysis are summarized in Table 5.2.

**Table 5.2 – Soil Samples Selected for Analytical Testing**

Borehole	Sample ID	Depth (m)	Material	Analysis
BW-7B	BW7-B SS2	0.8 – 1.4	Sand and Gravel Fill	Metals & Inorganics PHCs F1 to F4, BTEX, VOCs
BW-7B	BW7-B SS3	1.5 – 2.1	Clay Fill	Metals & Inorganics PHCs F1 to F4, BTEX, VOCs

For preliminary characterization of the on-site soils, the analytical data was compared to the MECP Table 1 “Full Depth Background Site Condition Standards” for Residential/Parkland/Institutional/Industrial/Commercial/Community (RPI/ICC) Property Uses, coarse textured soils (MECP Table 1 RPI/ICC Standards) to assess the suitability of the on-site reuse of excavated soils within the subject site as part of the proposed construction works.

On December 4, 2019, Ministry of Environment, Conservation and Parks (MECP) filed Ontario Regulation (O. Reg.) 406/19 “On-Site and Excess Soil Management” that is to be phased in over a period extending from January 1, 2021 to January 1, 2026 where the Rules for Soil Management and Excess Soil Quality Standards under this regulation are to be adopted on January 1, 2021. In this regard, the analytical data was also compared to Table 1 RPI/ICC Property Uses and Table 2.1 RPI Property Uses of the Excess Soil Quality Standards (ESQS) for Residential/Parkland/Institutional and/or Industrial/Commercial/Community Property Uses, coarse textured soils provided under MECP’s Rules for Soil Management and O. Reg. 406/19 for comparison purposes only at this time.



The results of the analytical laboratory testing indicate that the concentrations of the tested parameters met MECP Table 1 RPI/ICC Standards.

Comparison to the Table 1 RPI/ICC and Table 2.1 RPI ESQS indicate the concentrations of the tested parameters met the Standards.

Laboratory Certificates of Analysis are included in Appendix E. The measured concentrations and corresponding Standards are shown on the certificates of analysis.

## **6. ENGINEERING DISCUSSION AND RECOMMENDATIONS**

This section of the report provides preliminary geotechnical recommendations for design and construction of the trail and structure foundations. The recommendations are based on the subsurface soil and groundwater conditions encountered during the investigation. The soil conditions may vary between and beyond the borehole locations.

It is understood that potential structures, including boardwalks (in wetland, or partially saturated areas), stairs, and shade structures are proposed along the proposed trail route. It is also understood that raised granular trails may be constructed in place of boardwalks.

### **6.1 Preliminary Foundation Design**

Foundation construction for the proposed structures using spread footings, short augered caissons, or helical piers are considered feasible for foundation support. Difficulties with construction of conventional shallow foundations should be anticipated in locations where deeper fill and organic soil deposits are present and the groundwater level is high.

At this time, it is understood that the structures will be lightly loaded for use as pedestrian walkways and no vehicle access will be permitted. If the structures are required to support heavier loads, including vehicle traffic, the foundation options will need to be re-evaluated, and additional deeper boreholes may be required.

The preferred foundation system will depend on the local soil and groundwater conditions at each structure, foundation loads, construction constraints, and structural design considerations. The foundation options are discussed in the following sections.

#### **6.1.1 Spread Footings**

The structures may be supported on spread footings founded on the compact/stiff to very dense/hard, inorganic, native soils encountered in the boreholes. Excavation for footing



construction would need to extend through the surficial topsoil, organic and alluvial soils, and fill and into the competent native soils at the levels identified below. In areas with high groundwater levels, advance dewatering and/or sheet pile installation may be necessary to enable construction of footings in the dry. Factored geotechnical resistances of 150 kPa at ULS and 100 kPa at SLS may be employed for preliminary design of spread footings founded on the compact/stiff to very dense/hard, inorganic, native, soils at or below the levels listed as follows:

**Table 6.1 – Founding Levels for Spread Footing Design**

<b>Borehole No.</b>	<b>Minimum Founding Level (Depth Below Existing Ground Surface, m)</b>	<b>Founding Soil at Minimum Founding Level</b>	<b>Anticipated Groundwater Level (Depth Below Ground Surface, m)</b>
BW-1	0.9	Compact Silt and Sand	0.7
BW-2	2.4	Hard Clay Till	0.2
BW-3	0.9	Very Dense Silt Till	> 2.7
BW-4	0.9	Dense Sand Till	0.0 (Ground Surface)
BW-6	2.1	Compact Sand	0.3
BW-7A	No Suitable Bearing Material Found <sup>1</sup>	-	-
BW-7B	2.5	Hard Clay Till	1.1
SC-1	1.2	Hard Clay Till	4.3
SC-2A	No Suitable Bearing Material Found <sup>1</sup>	-	-
SC-2B	3.0	Dense Silt Till	2.3
SC-4A	1.5	Compact Silt Till	> 2.7
SC-4B	0.9	Compact Silt and Sand	> 2.9
SS-1	2.5	Stiff Clay	4.6

Note:

1. Boreholes BW-7A and SC-2A were not able to be advanced to sufficient depths to determine bearing capacity due to limitations of access, which limited the drilling equipment/methodology (continuous split spoon advanced by tripod)

#### 6.1.2 Helical Piers

It is considered feasible to employ helical piers extended into native inorganic, soils with SPT N-values greater than 25.



For preliminary design, a Chance RS2875 helical pier may be designed with a factored bearing resistance at ULS of 155 kN and an SLS resistance of 115 kN for native soils with SPT N-values greater than 25. It is noted that these are preliminary values are suitable for preliminary design only. Detailed design services for the helical piers are available through product suppliers. If required, higher capacities can be achieved with larger helical pier units.

If helical piers are employed, the design and installation should be completed by contractors that are approved by the manufacturer. Helical piers/anchors are proprietary products design, supplied and installed by specialist contractors. It is noted that the contractor should be responsible for the design capacity of the piers and it is recommended that load tests be conducted to verify helical pier capacities prior to final design.

The provided capacities are preliminary and must be confirmed with a specialist helical pier contractor and verified with load tests.

All work should be carried out in accordance with the Occupational Health and Safety Act (Ontario Regulation 213/91) and with local regulations.

#### 6.1.3 Short Augered Caissons

It is considered feasible to support the structures on caisson foundations. However, the installation of caissons may be particularly problematic in some structure locations due to the presence of obstructions, or cohesionless sand deposits and high groundwater levels. Construction may require use of a steel liner to maintain stability of the caisson sidewalls as well as techniques such as drilling slurry to prevent disturbance of the caisson base.

Caissons must be founded below frost depth, 1.4 m below ground surface, and extended into the compact/stiff to very dense/hard native, inorganic, soils. Founding levels, bearing capacities, and further evaluation of this option can be provided, if requested.

#### 6.1.4 Frost Cover

The depth of frost penetration at this site is approximately 1.4 m. All spread footings, caisson caps, or pile caps should be provided with a minimum of 1.4 m of earth cover or provided with an equivalent thickness of thermal insulation as protection against frost action, in accordance with OPSD 3090.101 (Foundation Frost Penetration Depths for Southern Ontario).



## **6.2 Floor Slab Construction**

It is understood that a floor slab will be constructed at the shade structure. The subsurface conditions encountered in Borehole SS-1 at this location comprised of fill to a depth of 2.2 m (Elev. 292.1) over stiff to hard/very dense native overburden.

The in-situ fill is not suitable for slab-on-grade support. Construction of the floor slab as a conventional slab-on-grade on engineered fill is considered feasible.

Preparation of the floor slab subgrade should include stripping of the fill and other deleterious material followed by proofrolling of the exposed subgrade with a heavy roller to ensure uniform adequate support. Any soft/wet areas identified shall be subexcavated and replaced with approved engineered fill, as described below.

All fill under the floor slab must consist of engineered fill. The engineered fill should consist of approved well graded inorganic material placed in maximum 200 mm thick lifts, within 2% of optimum moisture content, and compacted to at least 98% of SPMDD. The engineered fill must extend at least 1.0 m beyond the limits of the outer edge of the floor slab and extend downward and outward at a slope no greater than 45° to meet the subgrade.

A minimum 150 mm thick layer of well compacted free draining clear stone (or Granular A compacted to 98% SPMDD) meeting OPSS 1010 specifications is recommended directly beneath the floor slab. A polyethylene vapour barrier should be placed under the slab if a moisture sensitive finish is to be placed on the floor.

Exterior grades should be maintained at least 150 mm below the floor slab level and sloped to promote drainage away from the structure.

## **6.3 Granular Trail Design**

It is understood that a raised granular trail is being considered in lieu of boardwalks. At the time of this report, the proposed raised granular height above existing grades was not provided. For the purposes of this report it is assumed that the granular will be raised to a maximum of 2 m above existing grades.

Preparation of the subgrade should consist of removal of the topsoil, topsoil fill, fill, and organics, where possible, and proofrolling to expose very soft/loose or unstable areas. Proof rolling in areas of a high water table is recommended in the summer months when the water levels are anticipated to be lower, however this recommendation should be reviewed at the time of construction as it



may not be feasible to perform a proof roll if the soil is wet/saturated. Any soft/wet areas identified shall be subexcavated, if possible, and replaced with approved material within 2% of optimum moisture content, and compacted to at least 98% of SPMDD. It is understood the topsoil and/or organics will not be removed in certain areas to protect the roots of the trees. In this regard, proofrolling and subexcavation would not be possible in these areas and settlement and instability of the granular trail should be anticipated. It is noted that the organic layer extended to depths of 0.6 to 0.7 m, locally up to 1.8 m.

Wet and soft soil conditions can be expected, and contractors must adopt means and equipment to suit these conditions including groundwater control and restrictions for heavy equipment on unprotected subgrade.

The subgrade should be approved by geotechnical personnel prior to placement of bulk fill.

Fill placed to raise the grades should be placed as an engineered fill in uniform 200 mm thick lifts within 2% of the optimum moisture content. The engineered fill should comprise Granular B Type II meeting OPSS and should be compacted to at least 98% SPMDD. It may not be practical to compact the granular materials placed on topsoil in a wet environment. In this regard, uncompacted granular will be susceptible to erosion and will not generally be suitable for support of any vehicles.

As the raised granular trail is to be constructed in areas that could be partly or fully saturated during high water levels, the raised granular trail should be constructed with side slope inclinations of 3H:1V, or flatter and the side slopes must be provided with erosion protection in the form of rip-rap underlain with filter cloth.

As the fill and organic/alluvial soils will not be removed prior to placement of the granular, settlement of the trail should be anticipated and a maintenance program of regrading and/or addition of additional granular material would be required. The magnitude of the settlement will depend on the added volume of granular and the subexcavation level. Estimates of the anticipated settlement can be provided once more design details are known.

#### **6.4 Excavation and Groundwater Control**

Excavations for construction of the structure foundations are anticipated to extend through the surficial topsoil, fill and native organic/alluvial soils and into the competent compact/stiff to very dense/hard native overburden. Excavations to these soils are expected to extend up to 2 to 3 m below the measured groundwater levels at some of the structure locations.



All excavations should be carried out in accordance with the requirements of the Occupational Health and Safety Act (OHSA) and local regulations. Provided adequate groundwater control is achieved, the soils within the likely depth of excavation may be classed as Type 3 soils according to the Occupational Health and Safety Act criteria. Therefore, for open cut dewatered excavations, the side slopes should be cut at an inclination of 1H:1V from the bottom of the excavation. Where space restrictions preclude excavation of inclined slopes, excavation may be carried out using a trench box or temporary shoring.

Use of a hydraulic excavator should be suitable for excavation in the fill and native soils. The selection of the method of excavation is the responsibility of the contractor and must be based on their equipment, experience, and interpretation of the site conditions. The native overburden may contain cobbles and boulders and the contractor must be prepared to handle these obstructions.

It is noted that Boreholes SC-2A and BW-7A were terminated upon practical refusal to advance in the fill. Based on past aerial photographs, residential dwellings previously existed at the borehole locations. Difficulties with respect to the excavation of buried construction rubble, such as foundations and floor slabs that may be reinforced, as well as underground services left in place should be anticipated.

Seepage into excavations should be anticipated where excavations will extend below the observed water levels and measures such as heavy-duty pumping and/or perimeter wells may be required to maintain a dry excavation. Stream flow and surface water runoff must be diverted away from the excavations at all times during construction.

Effective dewatering operations rely on the Contractor's experience, construction techniques, sequencing, and work force efficiency.

It is recommended that in the tendering stage, prospective contractors conduct test pits to familiarize themselves with the on-site soil and groundwater conditions. The required dewatering should be established by the contractor in the context of a performance specification. The dewatering system should meet a performance specification to maintain and control the groundwater below the excavation base.

Groundwater control must be the responsibility of the contractor. The contractor must retain a dewatering specialist to design the dewatering system and identify effective measures for the conditions encountered. The dewatering plan should be submitted for information purposes before the start of excavation. The impact of the dewatering on local water wells or other



groundwater resources in the area would need to be assessed prior to adopting this method of construction.

A hydrogeological assessment to determine the anticipated dewatering rates, and assessment of impacts resulting from dewatering, including possible mitigations, would be recommended if the foundation design requires extending excavations below the water table (i.e. spread footing and caissons). A hydrogeological assessment is not anticipated for helical pier design. If the anticipated dewatering rates range between 50,000 and 400,000 L/day, the water taking must be registered on the Ministry of the Environment, Conservation and Parks (MECP) Environmental Activity and Sector Registry (EASR). A Permit to Take Water (PTTW) will be required if pumping rates are expected to exceed 400,000 L/day.

If possible, it is recommended that construction be carried out during the dry summer months, when groundwater levels are normally lowest to reduce the required dewatering. Groundwater levels will fluctuate subject to seasonal variations and precipitation patterns.

It is noted that groundwater sampling and chemical testing was not within the scope of this investigation. Sampling and testing of the ground water will be required to provided discharge options.

All work should be carried out in accordance with the current Occupational Health and Safety Act (Ontario Regulation 213/91) and with local regulations.

## **6.5 Soil Aggressiveness**

Based on the results of the corrosivity testing carried out on native soil samples, the native soil is not considered to be corrosive.

The measured sulphate concentrations indicate that buried concrete structures will not be subject to sulphate attack in the overburden soils.

## **6.6 Geoenvironmental Considerations**

The chemical sampling and testing program carried out during this investigation was completed for due diligence purposes to obtain a general understanding of the environmental quality of the soils on site. The environmental characteristics of the soils were inferred from a limited number of samples and sampling locations, and the extent of materials that may be encountered during construction was not delineated. As such, the environmental data and comments are provided as



guidance to the contractor on the requirements for reuse or disposal of materials generated during construction and should not be used to estimate quantities.

The results of the analytical laboratory testing indicate that the concentrations of the tested parameters met MECP Table 1 RPI/ICC Standards.

Comparison to the Table 1 RPI/ICC and Table 2.1 RPI ESQS indicate the concentrations of the tested parameters met the Standards.

A more comprehensive level of testing should be carried out for the off-site reuse of excess fill or native soils to verify that the environmental quality of the excess soils meets the site's analytical requirements and the requirements of O. Reg. 406/19 and the Excess Soil Quality Standards. In this regard and depending on the project design details, management strategies and receiving site requirements, the documentation and sampling and testing criteria of O. Reg. 406/19 may need to be met.

Alternatively, the excavated materials may be disposed of off-site at a licensed landfill facility with an ECA to receive this waste type. TCLP analysis will be required during construction on the actual materials to be disposed, if any, to verify the waste classification and the acceptance criteria of the waste management facility selected by the Contractor has been met.

Additional analytical testing of excavated soils will be required to further evaluate the environmental quality of the soil and confirm reuse and disposal requirements.

The "new" O. Reg. 406/19 may or may not apply to this project subject to specific design details (i.e. excavated quantities, soil management strategies involving excess soils that are to be reused off-site, receiving site analytical requirements). If the regulation applies, additional documentation, sampling and testing procedures (including prescribed leachate analysis) may be required to meet the criteria of O. Reg. 406/19. The regulation does not apply to the reuse of excavated soils on Site, and the project may be exempt from the registration, planning and sampling requirements of the regulation if excess soils are to be reused as part of another infrastructure project owned by the Project Leader (as defined by the Regulation) or public body.

No statement made herein should be construed as relieving the Contractor's responsibility to comply with all applicable federal and provincial regulations, municipal by-laws and guidelines related to the handling or disposal of excavated materials (and/or discharge of extracted groundwater).



## 7. CLOSURE

We trust the above provides the information you require at this time. If you have any questions regarding this report, please do not hesitate to contact us.

Yours truly,

Thurber Engineering Ltd.

Timothy Feather, B.Eng.  
Geotechnical Engineer-in-Training



Karel Furbacher, P.Eng.  
Geotechnical Engineer



Renato Pasqualoni, P.Eng.  
Review Principal

## STATEMENT OF LIMITATIONS AND CONDITIONS

### 1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

### 2. COMPLETE REPORT

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

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The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

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### 5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

### 6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

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The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



## **Appendix A**

### **Record of Borehole Sheets**

## SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

### 1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

### 2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

### 3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT <sup>(1)</sup> 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer



### 4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

### 5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample	TP Thin Wall Piston Sample	
	PH Sampler Advanced by Hydraulic Pressure	PM Sampler Advanced by Manual Pressure	
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

 Water Level  
 Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value      Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT      Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

# RECORD OF BOREHOLE BW-1







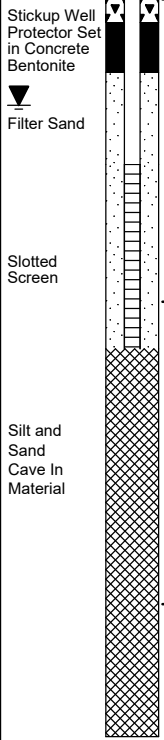

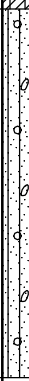
PROJECT : Rouge Park NE Trails  
LOCATION : Glasgow, Ontario  
STARTED : September 10, 2020  
COMPLETED : September 10, 2020

Project No. 28522

SHEET 1 OF 1

N 4 867 661.2 E 644 108.1

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE			SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m		nat V - 	rem V - 	Q - 	Cpen 		
		GROUND SURFACE		235.28										
		TOPSOIL (610mm)		0.00										
1		SILT and SAND, trace clay, compact to dense, light brown to grey, wet		234.67 0.61	1	SS	7							
					2	SS	17							
					3	SS	46							
2		CLAY, silty, trace sand and gravel, hard, grey		233.45 1.83	4	SS	30	Grain Size Analysis: Gr 0%/ Sa 2%/ Si 56%/ Cl 42%						
		SILT, some sand to sandy, trace to some clay, very dense to compact, grey, wet: (TILL)		232.84 2.44	5	SS	84							
3					6	SS	44							
4					7	SS	24							
					8	SS	26							
5		END OF BOREHOLE AT 4.88m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 36mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		230.40 4.88										
6		WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Oct 30/20 0.70 234.58												
7														
8														
9														

## GROUNDWATER ELEVATIONS

 WATER LEVEL UPON COMPLETION

 WATER LEVEL IN WELL/PIEZOMETER

October 30, 2020

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE BW-2

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 11, 2020  
 COMPLETED : September 11, 2020

Project No. 28522

SHEET 1 OF 1

N 4 867 940.2 E 644 188.9

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE		SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE		DYNAMIC CONE PENETRATION RESISTANCE PLOT	WATER CONTENT, PERCENT					
				DEPTH (m)					BLOWS/0.3m	wp	w			wl
		GROUND SURFACE		242.14										
	Manual SPT	TOPSOIL (225mm)		0.00			Grain Size Analysis: Gr 0%/ Sa 23%/ Si 41%/ Cl 36%							
		SILT, some sand, trace clay, loose to compact, dark grey, moist (ALLUVIAL)		0.23	1	SS		8						
1		CLAY, silty, some sand to sandy, stiff to firm, grey		241.46										
				0.69	2	SS		10						
2														

## GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▽ WATER LEVEL IN WELL/PIEZOMETER

October 30, 2020

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE BW-3



PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 17, 2020  
 COMPLETED : September 17, 2020

Project No. 28522

SHEET 1 OF 1

N 4 869 617.8 E 644 438.8

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE		SAMPLES			COMMENTS		SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC CONE PENETRATION RESISTANCE PLOT	WATER CONTENT, PERCENT							
				DEPTH (m)					wp  -----  w  -----  wl							
		GROUND SURFACE		265.24 0.00												
1	Manual SPT	TOPSOIL (610mm)			1	SS	12	Grain Size Analysis: Gr 1%/ Sa 23%/ Si 58%/ Cl 18%							Stickup Well Protector Set in Concrete	
		CLAY, silty, some sand to sandy, trace gravel, hard, grey: (TILL)			2	SS	73							Bentonite		
					3	SS	76									Filter Sand
					4	SS	78									
2						264.63 0.61			5	SS	150/					
					6	SS	50/ 0.025									
3		END OF BOREHOLE AT 2.72m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		262.53 2.72												
4		WATER LEVEL READINGS: DATE        DEPTH(m)    ELEV.(m) Oct 30/20     Dry        -														
5																
6																
7																
8																
9																

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE BW-4

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 18, 2020  
 COMPLETED : September 18, 2020

Project No. 28522

SHEET 1 OF 1

N 4 871 212.2 E 644 819.9

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE		SAMPLES			COMMENTS		SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC CONE PENETRATION RESISTANCE PLOT	WATER CONTENT, PERCENT						
				DEPTH (m)					wp ——— w ——— wl						
		GROUND SURFACE		264.63 0.00											
	Manual SPT	TOPSOIL (300mm)		264.32 0.30	1	SS	2							3280	 Stickup Well Protector Set in Concrete Bentonite  Filter Sand  Slotted Screen
		SAND, some silt, trace gravel, very loose to compact, brown, wet		263.71 0.91	2	SS	39								
1		SAND some silt to SAND and SILT, some gravel, dense to very dense, light brown, wet to saturated: (TILL)													
2															
3							Grain Size Analysis: Gr 12%/Sa 43%/Si 40%/ CI 5%								
		END OF BOREHOLE AT 3.05m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		261.58 3.05											
4		WATER LEVEL READINGS: DATE          DEPTH(m)      ELEV.(m) Oct 30/20        0.00          264.63													
5															
6															
7															
8															
9															

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE BW-6

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 16, 2020  
 COMPLETED : September 16, 2020

Project No. 28522

SHEET 1 OF 1

N 4 872 594.0 E 644 401.2

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE		SAMPLES			COMMENTS		SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC CONE PENETRATION RESISTANCE PLOT	WATER CONTENT, PERCENT									
				DEPTH (m)					wp         wl									
		GROUND SURFACE		285.21 0.00														
1	Manual SPT	ORGANIC SILT some sand and clay, trace to some gravel, very loose to compact, dark brown, wet to saturated			1	SS	1	Grain Size Analysis: Gr 1%/ Sa 87%/ Si 10%/ Cl 2%							Stickup Well Detector Set Concrete Bentonite			
					2	SS	3									2330	Filter Sand	
					3	SS	25									2410		
2		SAND, some to trace gravel, some silt, trace clay, compact to dense, grey, saturated: (TILL)			4	SS	13										Slotted Screen	
					5	SS	29											
					6	SS	49											
3					7	SS	47											
4		END OF BOREHOLE AT 4.27m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.			280.94 4.27													
5																		
6		WATER LEVEL READINGS: DATE        DEPTH(m)    ELEV.(m) Oct 23/20    0.33        284.88																
7																		
8																		
9																		

# RECORD OF BOREHOLE BW-7A

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 11, 2020  
 COMPLETED : September 11, 2020

Project No. 28522

SHEET 1 OF 1

N 4 870 901.1 E 644 746.6

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE			SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m		nat V - ●	rem V - ●	Q - ✕	C <sub>pen</sub> ▲		
		GROUND SURFACE		262.33										
		TOPSOIL (150mm)		0.00										
		CLAY, silty, trace to some sand, trace gravel, stiff to very stiff, light brown: (FILL)		0.15	1	SS	8							
1	Manual SPT				2	SS	23	Grain Size Analysis: Gr 0% / Sa 12% / Si 35% / Cl 53%						
		SAND and GRAVEL, trace silt, trace clay, compact, brown, moist: (FILL)		261.11 1.22	3	SS	15							
2		END OF BOREHOLE AT 1.85m UPON PRACTICAL REFUSAL TO ADVANCE ON PROBABLE CONCRETE.		260.48 1.85	4	SS	75							
							0.025							
3														
4														
5														
6														
7														
8														
9														

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE BW-7B

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 25, 2020  
 COMPLETED : September 25, 2020

Project No. 28522

SHEET 1 OF 1

N 4 870 890.0 E 644 749.0

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE		SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		nat V -	rem V -	Q -	Cpen		
		GROUND SURFACE		262.00									
		TOPSOIL FILL: (275mm)		0.00									
		SAND and GRAVEL, silty, occasional organics, loose to compact, brown, dry: (FILL)		261.72	1	SS	8						
1		Slight hydrocarbon odour		0.28									
					2	SS	18						
		CLAY, silty, trace sand, some gravel, firm, grey, with slight hydrocarbon odour: (FILL)		260.55									
				1.45									
2					3	SS	7						
		CLAY, silty, some sand and gravel, hard, grey: (TILL)		259.79									
				2.21									
					4	SS	30						
3													
					5	SS	40						
4													
					6	SS	46						
5													
					7	SS	70						
6													
7		END OF BOREHOLE AT 6.71m Monitoring Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen.		255.29									
				6.71									
8		WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Oct 30/20 1.09 260.91											
9													

## GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION

WATER LEVEL IN WELL/PIEZOMETER

October 30, 2020

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE SC-1

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 9, 2020  
 COMPLETED : September 9, 2020

Project No. 28522

SHEET 1 OF 1

N 4 866 526.1 E 644 281.1

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE			SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m		nat V - ●	rem V - ●	Q - X	Cpen ▲		
		GROUND SURFACE		232.51										
		TOPSOIL (600mm)		0.00										
1				231.90	1	SS	22							
		SILT, trace to some sand and gravel, occasional organics, very dense, brown to grey, moist (TILL)		0.61	2	SS	50							
					3	SS	91							
2				230.68										
		CLAY, silty, some sand to sandy, trace gravel, hard, brown to grey: (TILL)		1.83	4	SS	97	Grain Size Analysis: Gr 3%/ Sa 31%/ Si 35%/ Cl 31%						
					5	SS	111							
3					6	SS	90							
4					7	SS	53							
					8	SS	63							
5		END OF BOREHOLE AT 4.88m UPON PRACTICAL REFUSAL TO ADVANCE.		227.63										
				4.88										
6														
7														
8														
9														

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE SC-2A

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 12, 2020  
 COMPLETED : September 12, 2020

Project No. 28522

SHEET 1 OF 1

N 4 870 828.7 E 644 615.5

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE			SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m		nat V - ●	rem V - ●	Q - ▲	C <sub>pen</sub> - ▲		
		GROUND SURFACE		268.71										
		TOPSOIL FILL(100mm)												
		SAND and GRAVEL, silty, occasional concrete fragments, compact to very dense, brown, dry: (FILL)		0.10	1	SS	23							
1	Manual SPT				2	SS	36							
					3	SS	48							
2					4	SS	96							
		END OF BOREHOLE AT 2.44m UPON PRACTICAL REFUSAL TO ADVANCE.		266.28 2.44										
3														
4														
5														
6														
7														
8														
9														

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE SC-2B

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 25, 2020  
 COMPLETED : September 25, 2020

Project No. 28522

SHEET 1 OF 1

N 4 870 829.6 E 644 628.4

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE			SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m		nat V - ●	rem V - ●	Q - ▲	C <sub>pen</sub> - ▲		
		GROUND SURFACE		266.38										
		TOPSOIL FILL(250mm)		0.00										
		SILT, some gravel, compact, brown, dry: (FILL)		0.25	1	SS	13							
		TOPSOIL FILL(100mm)		265.69										
		SILT, some gravel, trace clay, compact to hard, grey, moist; with occasional concrete fragments: (FILL)		0.69										
1				0.86	2	SS	16							
2					3	SS	40							
					4	SS	40							
3		SILT, trace clay and sand, dense to very dense, grey, wet; with occasional sand layers: (TILL)		263.63										
				2.74										
					5	SS	54							
4														
5					6	SS	51							
6		END OF BOREHOLE AT 5.18m.		261.20										
				5.18										
7														
8														
9														

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE SC-4A

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 16, 2020  
 COMPLETED : September 16, 2020

Project No. 28522

SHEET 1 OF 1

N 4 872 863.4 E 644 444.8

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE			SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m		nat V - ●	rem V - ●	Q - ▲	C <sub>pen</sub> - ▲		
		GROUND SURFACE		287.37 0.00										
		TOPSOIL (610mm)			1	SS	2							
1	Manual SPT	SILT, sandy, trace organics, loose, brown, moist: (ALLUVIAL)		286.76 0.61	2	SS	9							
2		SILT and SAND, some gravel, compact to dense, light brown, moist: (TILL)		286.15 1.22	3	SS	17							
					4	SS	44							
				284.65 2.72	5	SS	150/0.125							
3		END OF BOREHOLE AT 2.72m UPON PRACTICAL REFUSAL TO ADVANCE. BOREHOLE BACKFILLED WITH BENTONITE.												
4														
5														
6														
7														
8														
9														

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE SC-4B

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : September 16, 2020  
 COMPLETED : September 16, 2020

Project No. 28522

SHEET 1 OF 1

N 4 872 845.4 E 644 444.8

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE			SAMPLES		COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		nat V -	rem V -	Q -	Cpen		
		GROUND SURFACE		282.00									
		TOPSOIL (610mm)		0.00									
1	Manual SPT	SILT and SAND, trace to some gravel, compact to very dense, brown, moist: (TILL)		281.39	1	SS	8						
				0.61	2	SS	17						
					3	SS	36						
2					4	SS	17						
					5	SS	78/ 0.275						
3		END OF BOREHOLE AT 2.87m UPON PRACTICAL REFUSAL TO ADVANCE. BOREHOLE BACKFILLED WITH BENTONITE.		279.13									
				2.87									
4													
5													
6													
7													
8													
9													

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC

CHECKED : KF



# RECORD OF BOREHOLE SS-1

PROJECT : Rouge Park NE Trails  
 LOCATION : Glasgow, Ontario  
 STARTED : July 17, 2020  
 COMPLETED : July 17, 2020

Project No. 28522

SHEET 1 OF 1

N 4 872 498.7 E 644 079.1

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE		SAMPLES			COMMENTS	SHEAR STRENGTH: Cu, KPa				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		nat V -	rem V -	Q -	Cpen		
		GROUND SURFACE		294.32									
		<b>SAND</b> , silty, some gravel, compact, beige, dry: (FILL)		0.00	1	SS	22						
1		<b>CLAY</b> , silty, trace sand and gravel, firm to very stiff, brown, moist: (FILL)		293.64 0.69	2	SS	4						
2					3	SS	17						
3		<b>CLAY</b> , silty to <b>SILT</b> , clayey, trace sand, oxidization, laminated with silt interbeds, stiff to hard, brown to grey, moist		292.11 2.21	4	SS	12						
					5	SS	32						
4					6	SS	16						
5					7	SS	20						
6													
7													
8		<b>SILT</b> , sandy, trace gravel, trace clay, silt lenses(<2mm), very dense, brown, moist		287.16 7.16									
		<b>GRAVEL</b> , sandy, trace gravel, trace clay, occasional cobbles, frequent oxidation, very dense, brown, moist		286.52 7.80	8	SS	69						
		<b>SILT</b> , sandy, some gravel, some clay, occasional cobbles, oxidization, very dense, brown, moist: (TILL)		286.09 8.23									
9					9	SS	75/						
		END OF BOREHOLE 9.35m. BOREHOLE CAVED TO 7.6m AND DRY UPON COMPLETION.		284.97 9.35			0.025						

## GROUNDWATER ELEVATIONS



WATER LEVEL UPON COMPLETION



WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB

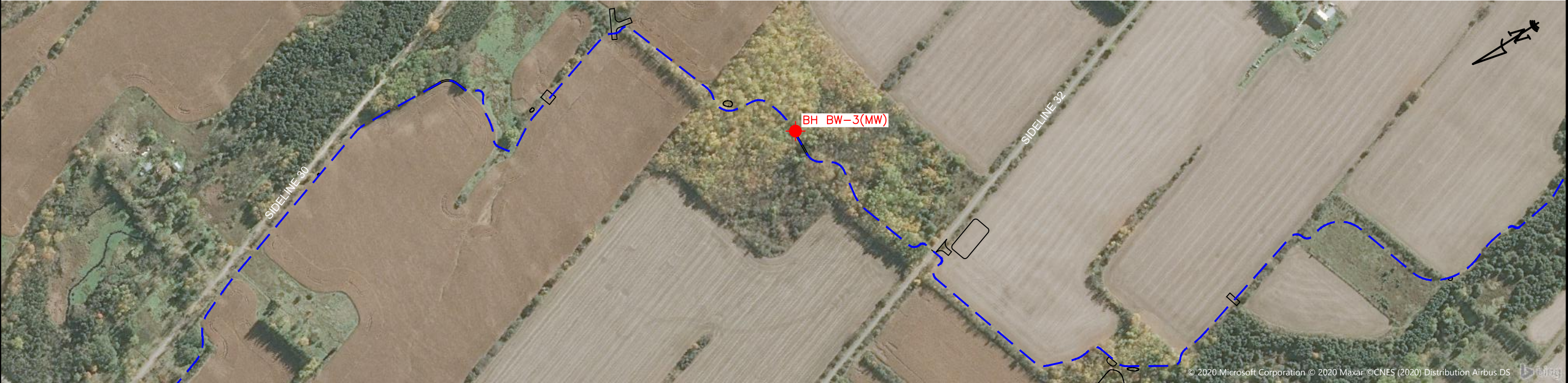
CHECKED : KF





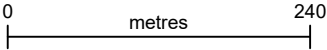
## **Appendix B**

### **Borehole Location Plans**

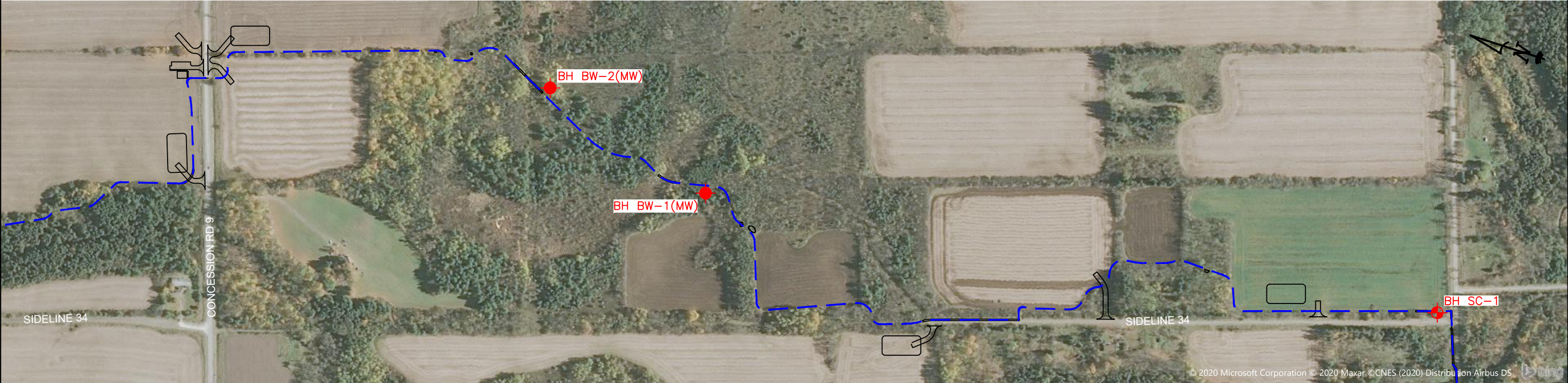


**LEGEND**

- BOREHOLE (BH) LOCATION
- BOREHOLE (BH) LOCATION WITH MONITORING WELL (MW)
- PROP. ROUGE PARK NE TRAIL

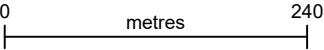



Dillon Consulting Limited		
TRAIL DESIGN ON NORTH EASTERN AREA LANDS ROUGE NATIONAL URBAN PARK		
BOREHOLE LOCATION PLAN		
JOB# 28522		
PREPARED : KF	DRAWN : BH	APPROVED : MRA
DATE : DECEMBER 2020	SCALE : 1:6000	DRAWING No. 28522-1



**LEGEND**

- BOREHOLE (BH) LOCATION
- BOREHOLE (BH) LOCATION WITH MONITORING WELL (MW)
- PROP. ROUGE PARK NE TRAIL



Dillon Consulting Limited		
TRAIL DESIGN ON NORTH EASTERN AREA LANDS ROUGE NATIONAL URBAN PARK		
BOREHOLE LOCATION PLAN		
JOB# 28522		
 THURBER ENGINEERING LTD.		
PREPARED : KF	DRAWN : BH	APPROVED : MRA
DATE : DECEMBER 2020	SCALE : 1:6000	DRAWING No. 28522-2



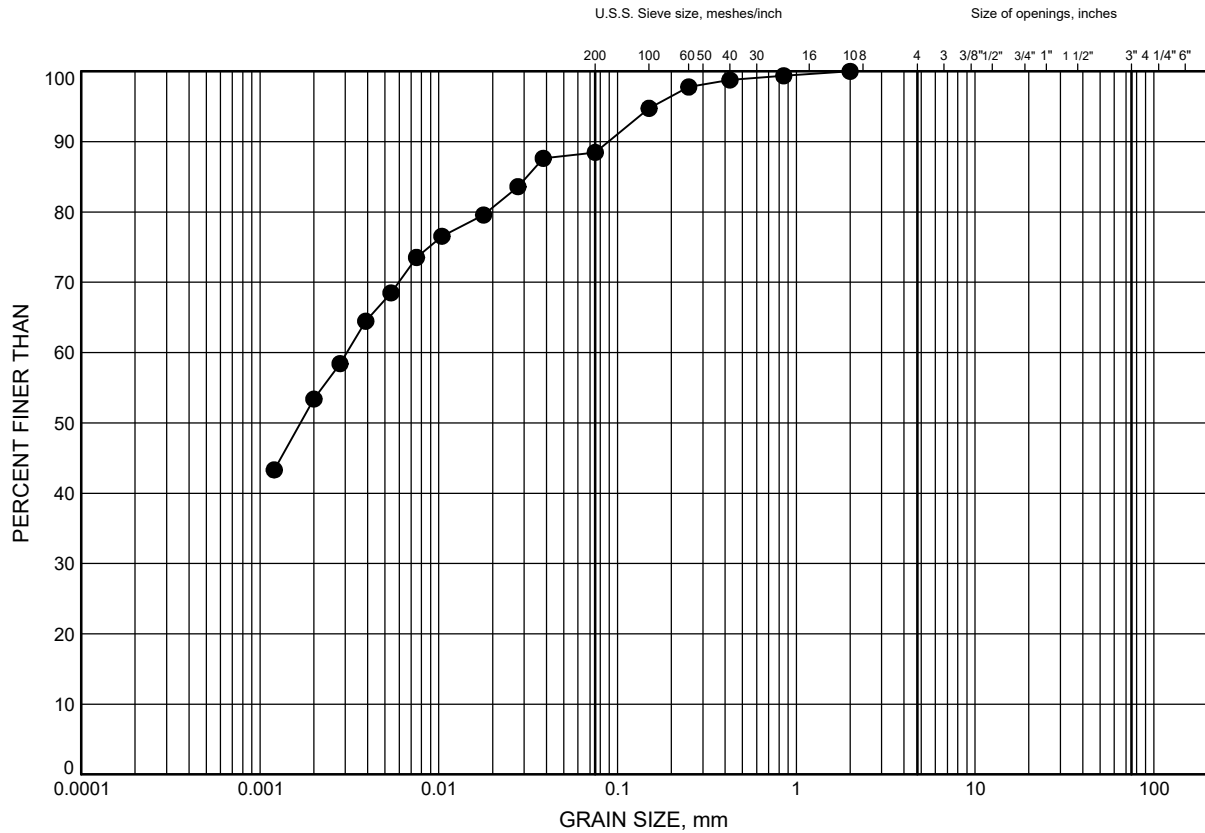
## **Appendix C**

### **Geotechnical Laboratory Soil Test Results**

# Rouge Park NE Trails GRAIN SIZE DISTRIBUTION

FIGURE C1

## Silty CLAY FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-7A	0.91	261.42

Date December 2020  
Project 28522

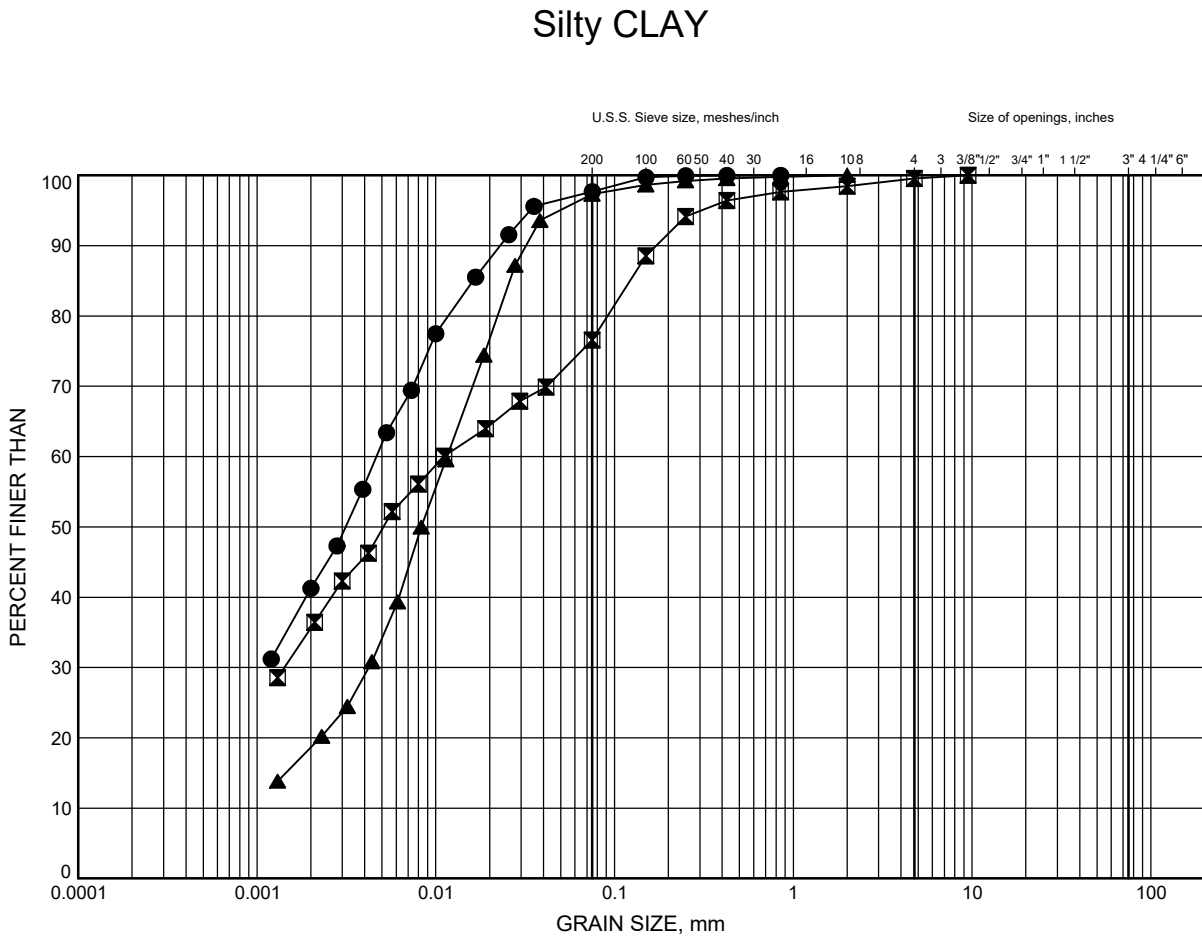


Prep'd AN  
Chkd. TF

# Rouge Park NE Trails

## GRAIN SIZE DISTRIBUTION

FIGURE C2



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-1	1.83	233.45
⊠	BW-2	1.52	240.62
▲	SS-1	2.59	291.73

Date December 2020  
Project 28522



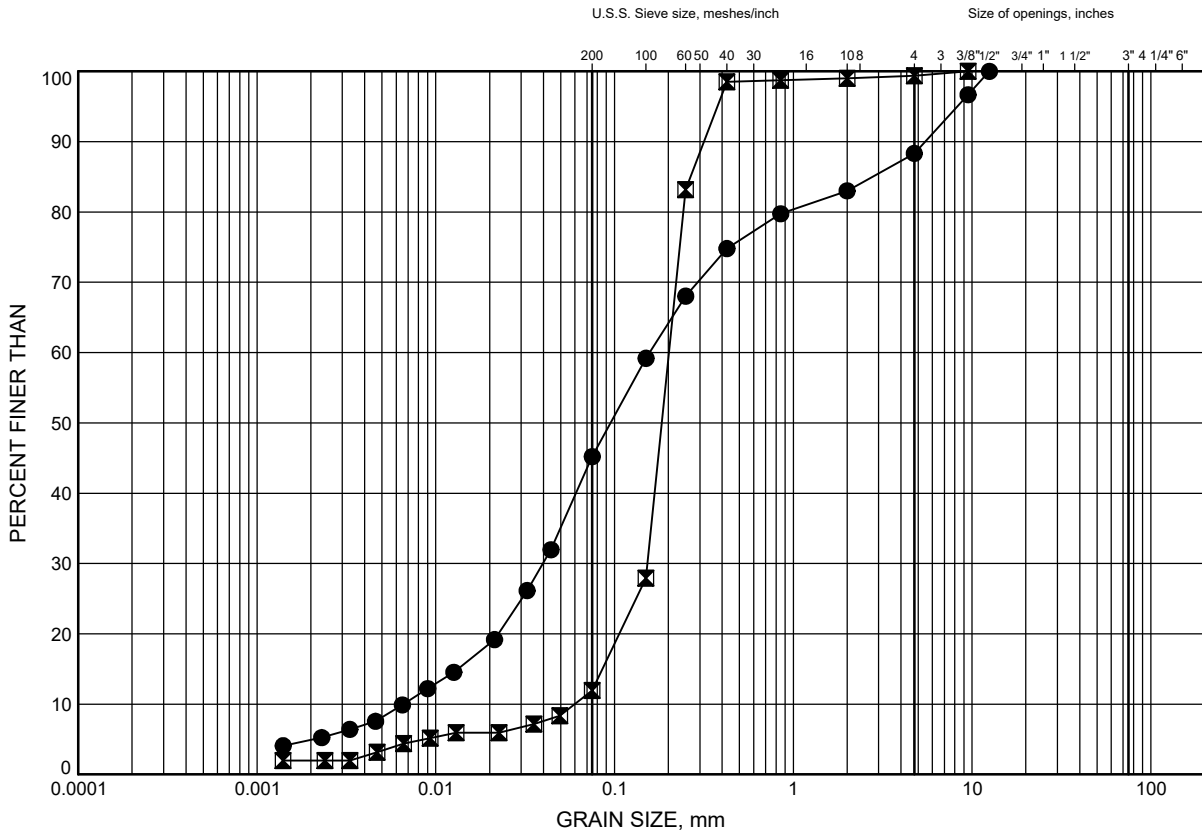
Prep'd AN  
Chkd. TF

# Rouge Park NE Trails

## GRAIN SIZE DISTRIBUTION

FIGURE C3

### Non-Plastic TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-4	2.74	261.88
⊠	BW-6	2.74	282.47

Date December 2020  
Project 28522



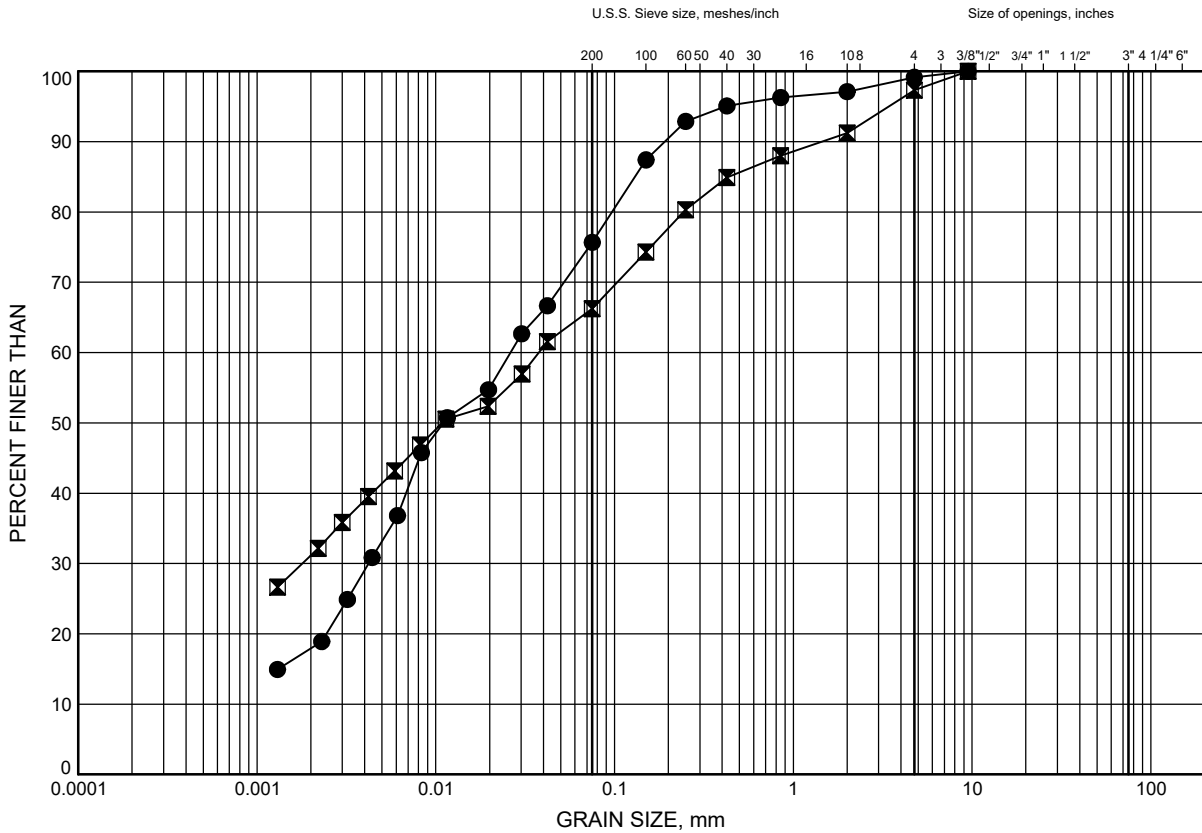
Prep'd AN  
Chkd. TF

# Rouge Park NE Trails

## GRAIN SIZE DISTRIBUTION

FIGURE C4

### Plastic TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-3	1.52	263.72
◻	SC-1	2.13	230.38

Date December 2020

Project 28522

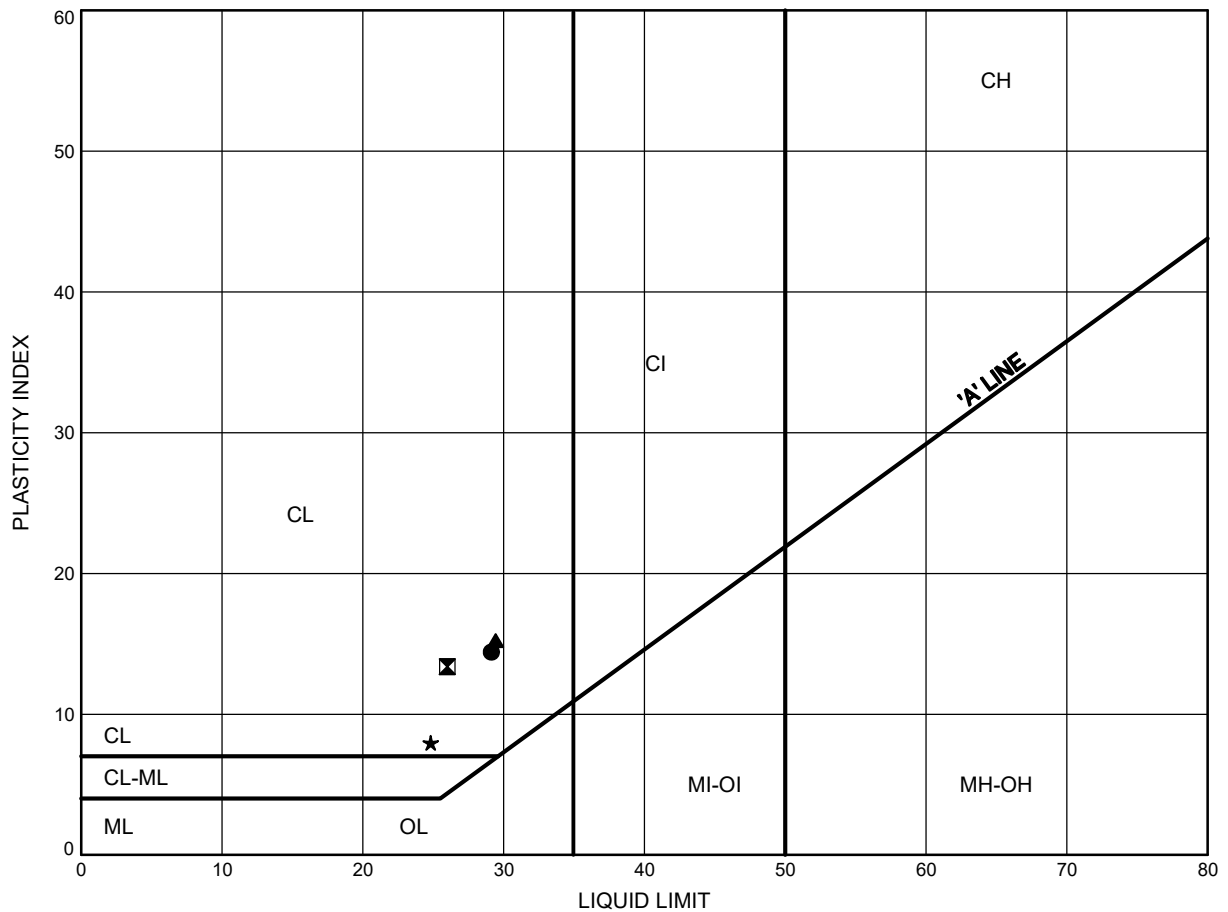


Prep'd AN

Chkd. TF

Rouge Park NE Trails  
**ATTERBERG LIMITS TEST RESULTS**

FIGURE C5



**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-1	2.13	233.15
⊠	BW-2	1.52	240.62
▲	SC-1	2.13	230.38
★	SS-1	2.59	291.73

Date December 2020  
 Project 28522



Prep'd AN  
 Chkd. TF



## **Appendix D**

### **Laboratory Certificate of Analysis Soil Aggressiveness**



## FINAL REPORT

CA14474-DEC20 R1

28522

Prepared for

**Thurber Engineering Ltd.**

## First Page

### CLIENT DETAILS

Client Thurber Engineering Ltd.

Address 103, 2010 Winston Park Drive  
Oakville, ON  
L6H 5R7, Canada

Contact Tim Feather

Telephone 905-745-7377

Facsimile

Email tfeather@thurber.ca

Project 28522

Order Number

Samples Soil (2)

### LABORATORY DETAILS

Project Specialist Jill Campbell, B.Sc.,GISAS

Laboratory SGS Canada Inc.

Address 185 Concession St., Lakefield ON, K0L 2H0

Telephone 2165

Facsimile 705-652-6365

Email jill.campbell@sgs.com

SGS Reference CA14474-DEC20

Received 12/15/2020

Approved 12/23/2020

Report Number CA14474-DEC20 R1

Date Reported 12/23/2020

### COMMENTS

Temperature of Sample upon Receipt: 4 degrees C

Cooling Agent Present:Yes

Custody Seal Present:Yes

Chain of Custody Number:C1

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

### SIGNATORIES

Jill Campbell, B.Sc.,GISAS







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# FINAL REPORT

CA14474-DEC20 R1

**Client:** Thurber Engineering Ltd.

**Project:** 28522

**Project Manager:** Tim Feather

**Samplers:** Madisan Chiarotto

## PACKAGE: - Corrosivity Index (SOIL)

<b>Sample Number</b>	5	6
<b>Sample Name</b>	BHSS-1 SS4	BHBW-1 SS2
<b>Sample Matrix</b>	Soil	Soil
<b>Sample Date</b>	17/07/2020	10/09/2020

Parameter	Units	RL		Result	Result
<b>Corrosivity Index</b>					
Corrosivity Index	none	1		4	4
Soil Redox Potential	mV	-		307	246
Sulphide (Na <sub>2</sub> CO <sub>3</sub> )	%	0.04		< 0.04	< 0.04
pH	pH Units	0.05		8.83	8.75
Resistivity (calculated)	ohms.cm	-9999		10000	6540

## PACKAGE: - General Chemistry (SOIL)

<b>Sample Number</b>	5	6
<b>Sample Name</b>	BHSS-1 SS4	BHBW-1 SS2
<b>Sample Matrix</b>	Soil	Soil
<b>Sample Date</b>	17/07/2020	10/09/2020

Parameter	Units	RL		Result	Result
<b>General Chemistry</b>					
Conductivity	uS/cm	2		100	153

## PACKAGE: - Metals and Inorganics (SOIL)

<b>Sample Number</b>	5	6
<b>Sample Name</b>	BHSS-1 SS4	BHBW-1 SS2
<b>Sample Matrix</b>	Soil	Soil
<b>Sample Date</b>	17/07/2020	10/09/2020

Parameter	Units	RL		Result	Result
<b>Metals and Inorganics</b>					
Moisture Content	%	0.1		13.4	18.4
Sulphate	µg/g	0.4		11	33



FINAL REPORT

CA14474-DEC20 R1

Client: Thurber Engineering Ltd.

Project: 28522

Project Manager: Tim Feather

Samplers: Madisan Chiarotto

PACKAGE: - Other (ORP) (SOIL)

Sample Number	5	6
Sample Name	BHSS-1 SS4	BHBW-1 SS2
Sample Matrix	Soil	Soil
Sample Date	17/07/2020	10/09/2020

Parameter	Units	RL		Result	Result
Other (ORP)					
Chloride	µg/g	0.4		13	6.6



FINAL REPORT

CA14474-DEC20 R1

QC SUMMARY

Anions by IC  
Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0295-DEC20	µg/g	0.4	<0.4	5	20	99	80	120	102	75	125
Sulphate	DIO0295-DEC20	µg/g	0.4	<0.4	20	20	98	80	120	91	75	125

Carbon/Sulphur  
Method: ASTM E1915-07A | Internal ref.: ME-CA-IENVIARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide (Na2CO3)	ECS0044-DEC20	%	0.04	< 0.04	ND	20	117	80	120			

Conductivity  
Method: SM 2510 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0255-DEC20	uS/cm	2	< 2	0	20	99	90	110	NA		



FINAL REPORT

CA14474-DEC20 R1

QC SUMMARY

pH  
Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0255-DEC20	pH Units	0.05	NA	0		100			NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

**Multielement Scan Qualifier:** as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

**Duplicate Qualifier:** for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

**Matrix Spike Qualifier:** for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

## LEGEND

### FOOTNOTES

**NSS** Insufficient sample for analysis.

**RL** Reporting Limit.

↑ Reporting limit raised.

↓ Reporting limit lowered.

**NA** The sample was not analysed for this analyte

**ND** Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at [http://www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm). The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full. This report supersedes all previous versions.

-- End of Analytical Report --

## Request for Laboratory Services and CHAIN OF CUSTODY

No: C1

Page 1 of 1

Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment  
 - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

## Laboratory Information Section - Lab use only

Received By: Maya el Alamedelaw Received By (signature): Maya el Alamedelaw CA-14474-Dec 20  
 Received Date (mm/dd/yy): 12/15/2020 Custody Seal Present: ☒ Cooling Agent Present: ☒ LAB LIMS #: 44444  
 Received Time: 11:05 Custody Seal Intact: ☒ Temperature Upon Receipt (°C): 4.4

REPORT INFORMATION		INVOICE INFORMATION		PROJECT INFORMATION	
Company:	Thurber Engineering Ltd.	<input checked="" type="checkbox"/> (same as Report Information)	Quotation #:	P.O. #:	
Contact:	Tim Feather	Company:	Project #:	Site Location/ID:	
Address:	103-2010 Winston Park Drive Oakville, Ontario	Contact:	28522		
Phone:	905-745-7377	Address:			
Email:	tfeather@thurber.ca	Phone:			
Email:		Email:			

**REGULATIONS**

Regulation 153/04: ☐ R/P/I ☐ J/C/C ☐ A/O ☐ Coarse ☐ Medium ☐ Fine

Soil Texture: ☐ PWO ☐ CCM ☐ MSA ☐ Other: ☐

Reg 347/558 (3 Day min TAT) ☐ PWQO ☐ MMER ☐ Other: ☐

Other Regulations: ☐ YES ☒ NO

Sewer By-Law: ☐ Sanitary ☐ Storm ☐ Municipality: ☐

RECORD OF SITE CONDITION (RSC)		DATE SAMPLED		TIME SAMPLED		# OF BOTTLES		MATRIX	
SAMPLE IDENTIFICATION		DATE SAMPLED		TIME SAMPLED		# OF BOTTLES		MATRIX	
1	BHSS-1 SS4	7/17/20	A.M.	1	SOIL				
2	BHBW-1 SS2	09/10/20	A.M.	1	SOIL				
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

ANALYSIS REQUESTED		TAT REQUIRED		RUSH TAT (Additional Charges May Apply):	
Field Filtered (Y/N)	<input type="checkbox"/>	Regular TAT (5-7days)	<input checked="" type="checkbox"/>	1 Day	2 Days
Metals & Inorganics	<input type="checkbox"/>	PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION			
PAH <input checked="" type="checkbox"/> ABN <input type="checkbox"/> SVOC(all) <input type="checkbox"/>	<input type="checkbox"/>	Rush Confirmation ID:			
PCB Total <input type="checkbox"/> Aroclor <input type="checkbox"/>	<input type="checkbox"/>	NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY			
PHC F1-F4 <input checked="" type="checkbox"/> VOC <input checked="" type="checkbox"/> BTEX <input checked="" type="checkbox"/> BTEX/F1 <input checked="" type="checkbox"/> F2-F4 <input checked="" type="checkbox"/>	<input type="checkbox"/>				
VOC <input type="checkbox"/> BTEX <input type="checkbox"/> THM <input type="checkbox"/>	<input type="checkbox"/>				
Pesticides OC <input type="checkbox"/> OP <input type="checkbox"/>	<input type="checkbox"/>				
TCLP M&I <input type="checkbox"/> VOC <input type="checkbox"/> PCB <input type="checkbox"/>	<input type="checkbox"/>				
B(a)P <input type="checkbox"/> ABN <input type="checkbox"/> Ignit <input type="checkbox"/>	<input type="checkbox"/>				
Water Pkg Gen. <input type="checkbox"/> Ext <input type="checkbox"/>	<input type="checkbox"/>				
Corrosivity/Resistivity	<input checked="" type="checkbox"/>				
Use: <input type="checkbox"/>	<input type="checkbox"/>				

OBSERVATIONS/SPECIAL INSTRUCTIONS		Date: 12/15/20		Date: 12/15/20	
Sampled By (NAME):	Madisan Chiarotto	Signature:	<u>TC</u>	Pink Copy - Client	
Relinquished by (NAME):	Tim Feather	Signature:	<u>TC</u>	Yellow & White Copy - SGS	



## **Appendix E**

### **Laboratory Certificates of Analysis Soil Management**



Your Project #: 28522  
Site Location: ROUGE PARK NE TRAILS  
Your C.O.C. #: N/A

**Attention: Karel Furbacher**

Thurber Engineering Ltd  
2010 Winston Park Dr  
Suite 103  
Oakville, ON  
CANADA L6H 5R7

**Report Date: 2020/10/08**  
Report #: R6362376  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BV LABS JOB #: COP7718**

**Received: 2020/10/01, 12:11**

Sample Matrix: Soil  
# Samples Received: 2

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Hot Water Extractable Boron	2	2020/10/05	2020/10/05	CAM SOP-00408	R153 Ana. Prot. 2011
1,3-Dichloropropene Sum	2	N/A	2020/10/07		EPA 8260C m
Free (WAD) Cyanide	2	2020/10/05	2020/10/06	CAM SOP-00457	OMOE E3015 m
Conductivity	2	2020/10/06	2020/10/06	CAM SOP-00414	OMOE E3530 v1 m
Hexavalent Chromium in Soil by IC (1)	2	2020/10/06	2020/10/06	CAM SOP-00436	EPA 3060/7199 m
Petroleum Hydrocarbons F2-F4 in Soil (2)	2	2020/10/05	2020/10/05	CAM SOP-00316	CCME CWS m
Strong Acid Leachable Metals by ICPMS	2	2020/10/05	2020/10/05	CAM SOP-00447	EPA 6020B m
Moisture	1	N/A	2020/10/02	CAM SOP-00445	Carter 2nd ed 51.2 m
Moisture	1	N/A	2020/10/03	CAM SOP-00445	Carter 2nd ed 51.2 m
pH CaCl2 EXTRACT	2	2020/10/05	2020/10/05	CAM SOP-00413	EPA 9045 D m
Sodium Adsorption Ratio (SAR)	2	N/A	2020/10/07	CAM SOP-00102	EPA 6010C
Volatile Organic Compounds and F1 PHCs	2	N/A	2020/10/07	CAM SOP-00230	EPA 8260C m

**Remarks:**

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs 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.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs 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 BV Labs, unless otherwise agreed in writing. BV Labs 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 BV Labs, results relate to the supplied samples tested.

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



Your Project #: 28522  
Site Location: ROUGE PARK NE TRAILS  
Your C.O.C. #: N/A

**Attention: Karel Furbacher**

Thurber Engineering Ltd  
2010 Winston Park Dr  
Suite 103  
Oakville, ON  
CANADA L6H 5R7

**Report Date: 2020/10/08**  
Report #: R6362376  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BV LABS JOB #: C0P7718**

**Received: 2020/10/01, 12:11**

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

(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas Laboratories 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**

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

Antonella Brasil, Senior Project Manager

Email: Antonella.Brasil@bvlabs.com

Phone# (905)817-5817

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BUREAU  
VERITAS

BV Labs Job #: COP7718  
Report Date: 2020/10/08

Thurber Engineering Ltd  
Client Project #: 28522  
Site Location: ROUGE PARK NE TRAILS  
Sampler Initials: KF

### O.REG 153 METALS & INORGANICS PKG (SOIL)

BV Labs ID		NUD352	NUD353		
Sampling Date		2020/09/25 12:00	2020/09/25 12:00		
	UNITS	BW7-B SS2	BW7-B SS3	RDL	QC Batch
<b>Calculated Parameters</b>					
Sodium Adsorption Ratio	N/A	0.29 (1)	0.38	N/A	6978874
<b>Inorganics</b>					
Conductivity	mS/cm	0.13	0.20	0.002	6984469
Available (CaCl <sub>2</sub> ) pH	pH	7.72	7.47	N/A	6982455
WAD Cyanide (Free)	ug/g	<0.01	0.01	0.01	6982833
Chromium (VI)	ug/g	<0.18	<0.18	0.18	6984440
<b>Metals</b>					
Hot Water Ext. Boron (B)	ug/g	0.073	0.65	0.050	6982670
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	0.20	6982344
Acid Extractable Arsenic (As)	ug/g	1.3	2.2	1.0	6982344
Acid Extractable Barium (Ba)	ug/g	34	42	0.50	6982344
Acid Extractable Beryllium (Be)	ug/g	0.25	0.22	0.20	6982344
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	5.0	6982344
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.12	0.10	6982344
Acid Extractable Chromium (Cr)	ug/g	11	9.8	1.0	6982344
Acid Extractable Cobalt (Co)	ug/g	3.8	3.9	0.10	6982344
Acid Extractable Copper (Cu)	ug/g	7.5	9.0	0.50	6982344
Acid Extractable Lead (Pb)	ug/g	4.1	7.1	1.0	6982344
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	0.50	6982344
Acid Extractable Nickel (Ni)	ug/g	7.5	7.1	0.50	6982344
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	0.50	6982344
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	0.20	6982344
Acid Extractable Thallium (Tl)	ug/g	0.072	0.10	0.050	6982344
Acid Extractable Uranium (U)	ug/g	0.41	0.47	0.050	6982344
Acid Extractable Vanadium (V)	ug/g	21	22	5.0	6982344
Acid Extractable Zinc (Zn)	ug/g	21	41	5.0	6982344
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	0.050	6982344
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable (1) Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.					

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VERITASBV Labs Job #: COP7718  
Report Date: 2020/10/08Thurber Engineering Ltd  
Client Project #: 28522  
Site Location: ROUGE PARK NE TRAILS  
Sampler Initials: KF**O.REG 153 VOCs BY HS & F1-F4 (SOIL)**

BV Labs ID		NUD352		NUD353		
Sampling Date		2020/09/25 12:00		2020/09/25 12:00		
	UNITS	BW7-B SS2	QC Batch	BW7-B SS3	RDL	QC Batch
<b>Inorganics</b>						
Moisture	%	11	6981373	15	1.0	6980292
<b>Calculated Parameters</b>						
1,3-Dichloropropene (cis+trans)	ug/g	<0.050	6979025	<0.050	0.050	6979025
<b>Volatile Organics</b>						
Acetone (2-Propanone)	ug/g	<0.50	6981441	<0.50	0.50	6981441
Benzene	ug/g	<0.020	6981441	<0.020	0.020	6981441
Bromodichloromethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Bromoform	ug/g	<0.050	6981441	<0.050	0.050	6981441
Bromomethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Carbon Tetrachloride	ug/g	<0.050	6981441	<0.050	0.050	6981441
Chlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Chloroform	ug/g	<0.050	6981441	<0.050	0.050	6981441
Dibromochloromethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,2-Dichlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,3-Dichlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,4-Dichlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Dichlorodifluoromethane (FREON 12)	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1-Dichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,2-Dichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1-Dichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
cis-1,2-Dichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
trans-1,2-Dichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,2-Dichloropropane	ug/g	<0.050	6981441	<0.050	0.050	6981441
cis-1,3-Dichloropropene	ug/g	<0.030	6981441	<0.030	0.030	6981441
trans-1,3-Dichloropropene	ug/g	<0.040	6981441	<0.040	0.040	6981441
Ethylbenzene	ug/g	<0.020	6981441	<0.020	0.020	6981441
Ethylene Dibromide	ug/g	<0.050	6981441	<0.050	0.050	6981441
Hexane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Methylene Chloride(Dichloromethane)	ug/g	<0.050	6981441	<0.050	0.050	6981441
Methyl Ethyl Ketone (2-Butanone)	ug/g	<0.50	6981441	<0.50	0.50	6981441
Methyl Isobutyl Ketone	ug/g	<0.50	6981441	<0.50	0.50	6981441
Methyl t-butyl ether (MTBE)	ug/g	<0.050	6981441	<0.050	0.050	6981441
Styrene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1,1,2-Tetrachloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						



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Thurber Engineering Ltd  
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Sampler Initials: KF

### O.REG 153 VOCs BY HS & F1-F4 (SOIL)

BV Labs ID		NUD352		NUD353		
Sampling Date		2020/09/25 12:00		2020/09/25 12:00		
	UNITS	BW7-B SS2	QC Batch	BW7-B SS3	RDL	QC Batch
1,1,2,2-Tetrachloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Tetrachloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Toluene	ug/g	<0.020	6981441	<0.020	0.020	6981441
1,1,1-Trichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1,2-Trichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Trichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Trichlorofluoromethane (FREON 11)	ug/g	<0.050	6981441	<0.050	0.050	6981441
Vinyl Chloride	ug/g	<0.020	6981441	<0.020	0.020	6981441
p+m-Xylene	ug/g	<0.020	6981441	<0.020	0.020	6981441
o-Xylene	ug/g	<0.020	6981441	<0.020	0.020	6981441
Total Xylenes	ug/g	<0.020	6981441	<0.020	0.020	6981441
F1 (C6-C10)	ug/g	<10	6981441	<10	10	6981441
F1 (C6-C10) - BTEX	ug/g	<10	6981441	<10	10	6981441
<b>F2-F4 Hydrocarbons</b>						
F2 (C10-C16 Hydrocarbons)	ug/g	<10	6982047	<10	10	6982047
F3 (C16-C34 Hydrocarbons)	ug/g	<50	6982047	<50	50	6982047
F4 (C34-C50 Hydrocarbons)	ug/g	<50	6982047	<50	50	6982047
Reached Baseline at C50	ug/g	Yes	6982047	Yes	N/A	6982047
<b>Surrogate Recovery (%)</b>						
o-Terphenyl	%	99	6982047	95	N/A	6982047
4-Bromofluorobenzene	%	95	6981441	97	N/A	6981441
D10-o-Xylene	%	111	6981441	113	N/A	6981441
D4-1,2-Dichloroethane	%	103	6981441	108	N/A	6981441
D8-Toluene	%	97	6981441	97	N/A	6981441
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable						



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### GENERAL COMMENTS

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

Package 1	8.0°C
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Results relate only to the items tested.



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### QUALITY ASSURANCE REPORT

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
	6980292	KJP	RPD	Moisture	2020/10/02	0		%	20
	6981373	KJP	RPD	Moisture	2020/10/03	0.63		%	20
	6981441	DR1	Matrix Spike	4-Bromofluorobenzene	2020/10/06		101	%	60 - 140
				D10-o-Xylene	2020/10/06		117	%	60 - 130
				D4-1,2-Dichloroethane	2020/10/06		109	%	60 - 140
				D8-Toluene	2020/10/06		102	%	60 - 140
				Acetone (2-Propanone)	2020/10/06		159 (1)	%	60 - 140
				Benzene	2020/10/06		111	%	60 - 140
				Bromodichloromethane	2020/10/06		109	%	60 - 140
				Bromoform	2020/10/06		109	%	60 - 140
				Bromomethane	2020/10/06		112	%	60 - 140
				Carbon Tetrachloride	2020/10/06		110	%	60 - 140
				Chlorobenzene	2020/10/06		106	%	60 - 140
				Chloroform	2020/10/06		109	%	60 - 140
				Dibromochloromethane	2020/10/06		110	%	60 - 140
				1,2-Dichlorobenzene	2020/10/06		106	%	60 - 140
				1,3-Dichlorobenzene	2020/10/06		107	%	60 - 140
				1,4-Dichlorobenzene	2020/10/06		108	%	60 - 140
				Dichlorodifluoromethane (FREON 12)	2020/10/06		105	%	60 - 140
				1,1-Dichloroethane	2020/10/06		116	%	60 - 140
				1,2-Dichloroethane	2020/10/06		112	%	60 - 140
				1,1-Dichloroethylene	2020/10/06		122	%	60 - 140
				cis-1,2-Dichloroethylene	2020/10/06		112	%	60 - 140
				trans-1,2-Dichloroethylene	2020/10/06		110	%	60 - 140
				1,2-Dichloropropane	2020/10/06		113	%	60 - 140
				cis-1,3-Dichloropropene	2020/10/06		111	%	60 - 140
				trans-1,3-Dichloropropene	2020/10/06		116	%	60 - 140
				Ethylbenzene	2020/10/06		111	%	60 - 140
				Ethylene Dibromide	2020/10/06		114	%	60 - 140
				Hexane	2020/10/06		126	%	60 - 140
				Methylene Chloride(Dichloromethane)	2020/10/06		108	%	60 - 140
				Methyl Ethyl Ketone (2-Butanone)	2020/10/06		156 (1)	%	60 - 140
				Methyl Isobutyl Ketone	2020/10/06		135	%	60 - 140
				Methyl t-butyl ether (MTBE)	2020/10/06		116	%	60 - 140
				Styrene	2020/10/06		113	%	60 - 140
				1,1,1,2-Tetrachloroethane	2020/10/06		109	%	60 - 140
				1,1,2,2-Tetrachloroethane	2020/10/06		112	%	60 - 140
				Tetrachloroethylene	2020/10/06		106	%	60 - 140
				Toluene	2020/10/06		104	%	60 - 140
				1,1,1-Trichloroethane	2020/10/06		111	%	60 - 140
				1,1,2-Trichloroethane	2020/10/06		111	%	60 - 140
				Trichloroethylene	2020/10/06		107	%	60 - 140
				Trichlorofluoromethane (FREON 11)	2020/10/06		117	%	60 - 140
				Vinyl Chloride	2020/10/06		114	%	60 - 140
				p+m-Xylene	2020/10/06		111	%	60 - 140
				o-Xylene	2020/10/06		113	%	60 - 140
				F1 (C6-C10)	2020/10/06		101	%	60 - 140
	6981441	DR1	Spiked Blank	4-Bromofluorobenzene	2020/10/06		100	%	60 - 140
				D10-o-Xylene	2020/10/06		99	%	60 - 130
				D4-1,2-Dichloroethane	2020/10/06		110	%	60 - 140
				D8-Toluene	2020/10/06		104	%	60 - 140



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Sampler Initials: KF

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acetone (2-Propanone)	2020/10/06		154 (1)	%	60 - 140
			Benzene	2020/10/06		98	%	60 - 130
			Bromodichloromethane	2020/10/06		99	%	60 - 130
			Bromoform	2020/10/06		106	%	60 - 130
			Bromomethane	2020/10/06		100	%	60 - 140
			Carbon Tetrachloride	2020/10/06		94	%	60 - 130
			Chlorobenzene	2020/10/06		95	%	60 - 130
			Chloroform	2020/10/06		98	%	60 - 130
			Dibromochloromethane	2020/10/06		103	%	60 - 130
			1,2-Dichlorobenzene	2020/10/06		97	%	60 - 130
			1,3-Dichlorobenzene	2020/10/06		95	%	60 - 130
			1,4-Dichlorobenzene	2020/10/06		97	%	60 - 130
			Dichlorodifluoromethane (FREON 12)	2020/10/06		89	%	60 - 140
			1,1-Dichloroethane	2020/10/06		102	%	60 - 130
			1,2-Dichloroethane	2020/10/06		105	%	60 - 130
			1,1-Dichloroethylene	2020/10/06		105	%	60 - 130
			cis-1,2-Dichloroethylene	2020/10/06		101	%	60 - 130
			trans-1,2-Dichloroethylene	2020/10/06		96	%	60 - 130
			1,2-Dichloropropane	2020/10/06		102	%	60 - 130
			cis-1,3-Dichloropropene	2020/10/06		101	%	60 - 130
			trans-1,3-Dichloropropene	2020/10/06		107	%	60 - 130
			Ethylbenzene	2020/10/06		96	%	60 - 130
			Ethylene Dibromide	2020/10/06		108	%	60 - 130
			Hexane	2020/10/06		107	%	60 - 130
			Methylene Chloride(Dichloromethane)	2020/10/06		99	%	60 - 130
			Methyl Ethyl Ketone (2-Butanone)	2020/10/06		154 (1)	%	60 - 140
			Methyl Isobutyl Ketone	2020/10/06		133 (1)	%	60 - 130
			Methyl t-butyl ether (MTBE)	2020/10/06		104	%	60 - 130
			Styrene	2020/10/06		102	%	60 - 130
			1,1,1,2-Tetrachloroethane	2020/10/06		99	%	60 - 130
			1,1,2,2-Tetrachloroethane	2020/10/06		109	%	60 - 130
			Tetrachloroethylene	2020/10/06		91	%	60 - 130
			Toluene	2020/10/06		92	%	60 - 130
			1,1,1-Trichloroethane	2020/10/06		96	%	60 - 130
			1,1,2-Trichloroethane	2020/10/06		105	%	60 - 130
			Trichloroethylene	2020/10/06		94	%	60 - 130
			Trichlorofluoromethane (FREON 11)	2020/10/06		99	%	60 - 130
			Vinyl Chloride	2020/10/06		99	%	60 - 130
			p+m-Xylene	2020/10/06		97	%	60 - 130
			o-Xylene	2020/10/06		99	%	60 - 130
			F1 (C6-C10)	2020/10/06		97	%	80 - 120
6981441	DR1	Method Blank	4-Bromofluorobenzene	2020/10/06		97	%	60 - 140
			D10-o-Xylene	2020/10/06		106	%	60 - 130
			D4-1,2-Dichloroethane	2020/10/06		106	%	60 - 140
			D8-Toluene	2020/10/06		97	%	60 - 140
			Acetone (2-Propanone)	2020/10/06	<0.50		ug/g	
			Benzene	2020/10/06	<0.020		ug/g	
			Bromodichloromethane	2020/10/06	<0.050		ug/g	
			Bromoform	2020/10/06	<0.050		ug/g	
			Bromomethane	2020/10/06	<0.050		ug/g	
			Carbon Tetrachloride	2020/10/06	<0.050		ug/g	



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Thurber Engineering Ltd  
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Sampler Initials: KF

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
6981441	DR1	RPD	Chlorobenzene	2020/10/06	<0.050		ug/g	
			Chloroform	2020/10/06	<0.050		ug/g	
			Dibromochloromethane	2020/10/06	<0.050		ug/g	
			1,2-Dichlorobenzene	2020/10/06	<0.050		ug/g	
			1,3-Dichlorobenzene	2020/10/06	<0.050		ug/g	
			1,4-Dichlorobenzene	2020/10/06	<0.050		ug/g	
			Dichlorodifluoromethane (FREON 12)	2020/10/06	<0.050		ug/g	
			1,1-Dichloroethane	2020/10/06	<0.050		ug/g	
			1,2-Dichloroethane	2020/10/06	<0.050		ug/g	
			1,1-Dichloroethylene	2020/10/06	<0.050		ug/g	
			cis-1,2-Dichloroethylene	2020/10/06	<0.050		ug/g	
			trans-1,2-Dichloroethylene	2020/10/06	<0.050		ug/g	
			1,2-Dichloropropane	2020/10/06	<0.050		ug/g	
			cis-1,3-Dichloropropene	2020/10/06	<0.030		ug/g	
			trans-1,3-Dichloropropene	2020/10/06	<0.040		ug/g	
			Ethylbenzene	2020/10/06	<0.020		ug/g	
			Ethylene Dibromide	2020/10/06	<0.050		ug/g	
			Hexane	2020/10/06	<0.050		ug/g	
			Methylene Chloride(Dichloromethane)	2020/10/06	<0.050		ug/g	
			Methyl Ethyl Ketone (2-Butanone)	2020/10/06	<0.50		ug/g	
			Methyl Isobutyl Ketone	2020/10/06	<0.50		ug/g	
			Methyl t-butyl ether (MTBE)	2020/10/06	<0.050		ug/g	
			Styrene	2020/10/06	<0.050		ug/g	
			1,1,1,2-Tetrachloroethane	2020/10/06	<0.050		ug/g	
			1,1,2,2-Tetrachloroethane	2020/10/06	<0.050		ug/g	
			Tetrachloroethylene	2020/10/06	<0.050		ug/g	
			Toluene	2020/10/06	<0.020		ug/g	
			1,1,1-Trichloroethane	2020/10/06	<0.050		ug/g	
			1,1,2-Trichloroethane	2020/10/06	<0.050		ug/g	
			Trichloroethylene	2020/10/06	<0.050		ug/g	
			Trichlorofluoromethane (FREON 11)	2020/10/06	<0.050		ug/g	
			Vinyl Chloride	2020/10/06	<0.020		ug/g	
			p+m-Xylene	2020/10/06	<0.020		ug/g	
			o-Xylene	2020/10/06	<0.020		ug/g	
			Total Xylenes	2020/10/06	<0.020		ug/g	
			F1 (C6-C10)	2020/10/06	<10		ug/g	
			F1 (C6-C10) - BTEX	2020/10/06	<10		ug/g	
			Acetone (2-Propanone)	2020/10/07	NC		%	50
			Benzene	2020/10/07	NC		%	50
			Bromodichloromethane	2020/10/07	NC		%	50
			Bromoform	2020/10/07	NC		%	50
			Bromomethane	2020/10/07	NC		%	50
			Carbon Tetrachloride	2020/10/07	NC		%	50
			Chlorobenzene	2020/10/07	NC		%	50
			Chloroform	2020/10/07	NC		%	50
			Dibromochloromethane	2020/10/07	NC		%	50
			1,2-Dichlorobenzene	2020/10/07	NC		%	50
			1,3-Dichlorobenzene	2020/10/07	NC		%	50
			1,4-Dichlorobenzene	2020/10/07	NC		%	50
			Dichlorodifluoromethane (FREON 12)	2020/10/07	NC		%	50
			1,1-Dichloroethane	2020/10/07	NC		%	50



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### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			1,2-Dichloroethane	2020/10/07	NC		%	50
			1,1-Dichloroethylene	2020/10/07	NC		%	50
			cis-1,2-Dichloroethylene	2020/10/07	NC		%	50
			trans-1,2-Dichloroethylene	2020/10/07	NC		%	50
			1,2-Dichloropropane	2020/10/07	NC		%	50
			cis-1,3-Dichloropropene	2020/10/07	NC		%	50
			trans-1,3-Dichloropropene	2020/10/07	NC		%	50
			Ethylbenzene	2020/10/07	NC		%	50
			Ethylene Dibromide	2020/10/07	NC		%	50
			Hexane	2020/10/07	NC		%	50
			Methylene Chloride(Dichloromethane)	2020/10/07	NC		%	50
			Methyl Ethyl Ketone (2-Butanone)	2020/10/07	NC		%	50
			Methyl Isobutyl Ketone	2020/10/07	NC		%	50
			Methyl t-butyl ether (MTBE)	2020/10/07	NC		%	50
			Styrene	2020/10/07	NC		%	50
			1,1,1,2-Tetrachloroethane	2020/10/07	NC		%	50
			1,1,2,2-Tetrachloroethane	2020/10/07	NC		%	50
			Tetrachloroethylene	2020/10/07	NC		%	50
			Toluene	2020/10/07	NC		%	50
			1,1,1-Trichloroethane	2020/10/07	NC		%	50
			1,1,2-Trichloroethane	2020/10/07	NC		%	50
			Trichloroethylene	2020/10/07	NC		%	50
			Trichlorofluoromethane (FREON 11)	2020/10/07	NC		%	50
			Vinyl Chloride	2020/10/07	NC		%	50
			p+m-Xylene	2020/10/07	NC		%	50
			o-Xylene	2020/10/07	NC		%	50
			Total Xylenes	2020/10/07	NC		%	50
			F1 (C6-C10)	2020/10/07	NC		%	30
			F1 (C6-C10) - BTEX	2020/10/07	NC		%	30
6982047	AS2	Matrix Spike	o-Terphenyl	2020/10/05		104	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2020/10/05		100	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2020/10/05		110	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2020/10/05		109	%	50 - 130
6982047	AS2	Spiked Blank	o-Terphenyl	2020/10/05		97	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2020/10/05		94	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2020/10/05		103	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2020/10/05		102	%	80 - 120
6982047	AS2	Method Blank	o-Terphenyl	2020/10/05		98	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2020/10/05	<10		ug/g	
			F3 (C16-C34 Hydrocarbons)	2020/10/05	<50		ug/g	
			F4 (C34-C50 Hydrocarbons)	2020/10/05	<50		ug/g	
6982047	AS2	RPD	F2 (C10-C16 Hydrocarbons)	2020/10/05	NC		%	30
			F3 (C16-C34 Hydrocarbons)	2020/10/05	NC		%	30
			F4 (C34-C50 Hydrocarbons)	2020/10/05	NC		%	30
6982344	DT1	Matrix Spike	Acid Extractable Antimony (Sb)	2020/10/05		87	%	75 - 125
			Acid Extractable Arsenic (As)	2020/10/05		97	%	75 - 125
			Acid Extractable Barium (Ba)	2020/10/05		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2020/10/05		95	%	75 - 125
			Acid Extractable Boron (B)	2020/10/05		82	%	75 - 125
			Acid Extractable Cadmium (Cd)	2020/10/05		97	%	75 - 125
			Acid Extractable Chromium (Cr)	2020/10/05		107	%	75 - 125



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Thurber Engineering Ltd  
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Sampler Initials: KF

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
6982344	DT1	Spiked Blank	Acid Extractable Cobalt (Co)	2020/10/05		101	%	75 - 125
			Acid Extractable Copper (Cu)	2020/10/05		97	%	75 - 125
			Acid Extractable Lead (Pb)	2020/10/05		NC	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2020/10/05		97	%	75 - 125
			Acid Extractable Nickel (Ni)	2020/10/05		103	%	75 - 125
			Acid Extractable Selenium (Se)	2020/10/05		98	%	75 - 125
			Acid Extractable Silver (Ag)	2020/10/05		96	%	75 - 125
			Acid Extractable Thallium (Tl)	2020/10/05		96	%	75 - 125
			Acid Extractable Uranium (U)	2020/10/05		98	%	75 - 125
			Acid Extractable Vanadium (V)	2020/10/05		NC	%	75 - 125
			Acid Extractable Zinc (Zn)	2020/10/05		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/10/05		91	%	75 - 125
			Acid Extractable Antimony (Sb)	2020/10/05		100	%	80 - 120
			Acid Extractable Arsenic (As)	2020/10/05		97	%	80 - 120
			Acid Extractable Barium (Ba)	2020/10/05		93	%	80 - 120
			Acid Extractable Beryllium (Be)	2020/10/05		96	%	80 - 120
			Acid Extractable Boron (B)	2020/10/05		98	%	80 - 120
			Acid Extractable Cadmium (Cd)	2020/10/05		99	%	80 - 120
			Acid Extractable Chromium (Cr)	2020/10/05		97	%	80 - 120
			Acid Extractable Cobalt (Co)	2020/10/05		99	%	80 - 120
			Acid Extractable Copper (Cu)	2020/10/05		100	%	80 - 120
			Acid Extractable Lead (Pb)	2020/10/05		98	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2020/10/05		98	%	80 - 120
			Acid Extractable Nickel (Ni)	2020/10/05		98	%	80 - 120
			Acid Extractable Selenium (Se)	2020/10/05		102	%	80 - 120
			Acid Extractable Silver (Ag)	2020/10/05		101	%	80 - 120
			Acid Extractable Thallium (Tl)	2020/10/05		97	%	80 - 120
			Acid Extractable Uranium (U)	2020/10/05		97	%	80 - 120
			Acid Extractable Vanadium (V)	2020/10/05		101	%	80 - 120
			Acid Extractable Zinc (Zn)	2020/10/05		97	%	80 - 120
			Acid Extractable Mercury (Hg)	2020/10/05		97	%	80 - 120
6982344	DT1	Method Blank	Acid Extractable Antimony (Sb)	2020/10/05	<0.20		ug/g	
			Acid Extractable Arsenic (As)	2020/10/05	<1.0		ug/g	
			Acid Extractable Barium (Ba)	2020/10/05	<0.50		ug/g	
			Acid Extractable Beryllium (Be)	2020/10/05	<0.20		ug/g	
			Acid Extractable Boron (B)	2020/10/05	<5.0		ug/g	
			Acid Extractable Cadmium (Cd)	2020/10/05	<0.10		ug/g	
			Acid Extractable Chromium (Cr)	2020/10/05	<1.0		ug/g	
			Acid Extractable Cobalt (Co)	2020/10/05	<0.10		ug/g	
			Acid Extractable Copper (Cu)	2020/10/05	<0.50		ug/g	
			Acid Extractable Lead (Pb)	2020/10/05	<1.0		ug/g	
			Acid Extractable Molybdenum (Mo)	2020/10/05	<0.50		ug/g	
			Acid Extractable Nickel (Ni)	2020/10/05	<0.50		ug/g	
			Acid Extractable Selenium (Se)	2020/10/05	<0.50		ug/g	
			Acid Extractable Silver (Ag)	2020/10/05	<0.20		ug/g	
			Acid Extractable Thallium (Tl)	2020/10/05	<0.050		ug/g	
			Acid Extractable Uranium (U)	2020/10/05	<0.050		ug/g	
			Acid Extractable Vanadium (V)	2020/10/05	<5.0		ug/g	
			Acid Extractable Zinc (Zn)	2020/10/05	<5.0		ug/g	
			Acid Extractable Mercury (Hg)	2020/10/05	<0.050		ug/g	
6982344	DT1	RPD	Acid Extractable Antimony (Sb)	2020/10/05	22		%	30



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Sampler Initials: KF

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Arsenic (As)	2020/10/05	2.9		%	30
			Acid Extractable Barium (Ba)	2020/10/05	0.14		%	30
			Acid Extractable Beryllium (Be)	2020/10/05	1.2		%	30
			Acid Extractable Boron (B)	2020/10/05	8.8		%	30
			Acid Extractable Cadmium (Cd)	2020/10/05	NC		%	30
			Acid Extractable Chromium (Cr)	2020/10/05	1.2		%	30
			Acid Extractable Cobalt (Co)	2020/10/05	1.4		%	30
			Acid Extractable Copper (Cu)	2020/10/05	1.2		%	30
			Acid Extractable Lead (Pb)	2020/10/05	0.095		%	30
			Acid Extractable Molybdenum (Mo)	2020/10/05	24		%	30
			Acid Extractable Nickel (Ni)	2020/10/05	2.7		%	30
			Acid Extractable Selenium (Se)	2020/10/05	NC		%	30
			Acid Extractable Silver (Ag)	2020/10/05	NC		%	30
			Acid Extractable Thallium (Tl)	2020/10/05	4.2		%	30
			Acid Extractable Uranium (U)	2020/10/05	3.7		%	30
			Acid Extractable Vanadium (V)	2020/10/05	3.0		%	30
			Acid Extractable Zinc (Zn)	2020/10/05	19		%	30
			Acid Extractable Mercury (Hg)	2020/10/05	11		%	30
6982455	YPA	Spiked Blank	Available (CaCl <sub>2</sub> ) pH	2020/10/05		100	%	97 - 103
6982455	YPA	RPD	Available (CaCl <sub>2</sub> ) pH	2020/10/05	0.15		%	N/A
6982670	JOH	Matrix Spike	Hot Water Ext. Boron (B)	2020/10/05		105	%	75 - 125
6982670	JOH	Spiked Blank	Hot Water Ext. Boron (B)	2020/10/05		93	%	75 - 125
6982670	JOH	Method Blank	Hot Water Ext. Boron (B)	2020/10/05	<0.050		ug/g	
6982670	JOH	RPD	Hot Water Ext. Boron (B)	2020/10/05	3.0		%	40
6982833	GTO	Matrix Spike	WAD Cyanide (Free)	2020/10/06		88	%	75 - 125
6982833	GTO	Spiked Blank	WAD Cyanide (Free)	2020/10/06		89	%	80 - 120
6982833	GTO	Method Blank	WAD Cyanide (Free)	2020/10/06	<0.01		ug/g	
6982833	GTO	RPD	WAD Cyanide (Free)	2020/10/06	NC		%	35
6984440	RSU	Matrix Spike	Chromium (VI)	2020/10/06		65 (2)	%	70 - 130
6984440	RSU	Spiked Blank	Chromium (VI)	2020/10/06		83	%	80 - 120
6984440	RSU	Method Blank	Chromium (VI)	2020/10/06	<0.18		ug/g	
6984440	RSU	RPD	Chromium (VI)	2020/10/06	NC		%	35
6984469	SAU	Spiked Blank	Conductivity	2020/10/06		104	%	90 - 110
6984469	SAU	Method Blank	Conductivity	2020/10/06	<0.002		mS/cm	



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### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
6984469	SAU	RPD	Conductivity	2020/10/06	4.1		%	10
<p>N/A = Not Applicable</p> <p>Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.</p> <p>Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.</p> <p>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.</p> <p>Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.</p> <p>Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.</p> <p>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)</p> <p>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 <math>\leq 2 \times \text{RDL}</math>).</p> <p>(1) The recovery was above the upper control limit. This may represent a high bias in some results for this specific analyte. For results that were not detected (ND), this potential bias has no impact.</p> <p>(2) The matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample. The sample was reanalyzed with the same results</p>								



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### VALIDATION SIGNATURE PAGE

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

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Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

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BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



6740 Campobello Road, Mississauga, Ontario L5N 2L8  
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CAM FCD-01191/5

# CHAIN OF CUSTODY RECORD

Page 1 of 1

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required	
Company Name: <b>Thurber Engineering Ltd.</b>		Company Name:		Quotation #:		<input checked="" type="checkbox"/> Regular TAT (5-7 days) Most analyses	
Contact Name: <b>Karel Furbacher</b>		Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS	
Address: <b>103, 2010 Winston Park Drive</b>		Address:		Project #: <b>28522</b>		Rush TAT (Surcharges will be applied)	
<b>Oakville, Ontario</b>				Site Location: <b>Rouge Park NE Trails</b>		<input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3-4 Days	
Phone: <b>2894557296</b> Fax:		Phone: Fax:		Site #:		Date Required:	
Email: <b>kfurbacher@thurber.ca</b>		Email:		Site Location Province:		Rush Confirmation #:	
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS LABORATORIES' DRINKING WATER CHAIN OF CUSTODY							
Regulation 153		Other Regulations		Analysis Requested		LABORATORY USE ONLY	
<input checked="" type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/ Fine		<input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw				CUSTODY SEAL	
<input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse		<input type="checkbox"/> MISA <input type="checkbox"/> Storm Sewer Bylaw				Y (N)	
<input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/ Other		<input type="checkbox"/> PWQO Region				Present Intact	
<input checked="" type="checkbox"/> Table 2.1 RPI		<input type="checkbox"/> Other (Specify)				COOLER TEMPERATURES	
FOR RSC (PLEASE CIRCLE) Y / <b>N</b>		<input type="checkbox"/> REG 558 (MIN. 3 DAY TAT REQUIRED)				10/9/5	
Include Criteria on Certificate of Analysis: <b>Y</b> / N							
SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS							
SAMPLE IDENTIFICATION		DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	HOLD-DO NOT ANALYZE
1	BW7-B SS2	2020-09-25	12:00	Soil	4	X X X X	
2	BW7-B SS3	2020-09-25	12:00	Soil	4	X X X X	
3							
4							
5							
6							
7							
8							
9							
10							
REUNQUISHED BY: (Signature/Print)		DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)		DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Karel Furbacher		2020-10-01	1:00	<i>[Signature]</i>		2020-10-01	11:40
				<i>[Signature]</i>		2020-10-01	12:11

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Bureau Veritas Laboratories' standard Terms and Conditions. Signing of this Chain of Custody document is available at <http://www.bvlabs.com/terms-and-conditions>

BV Drive

01-Oct-20 12:11

Antonella Brasil

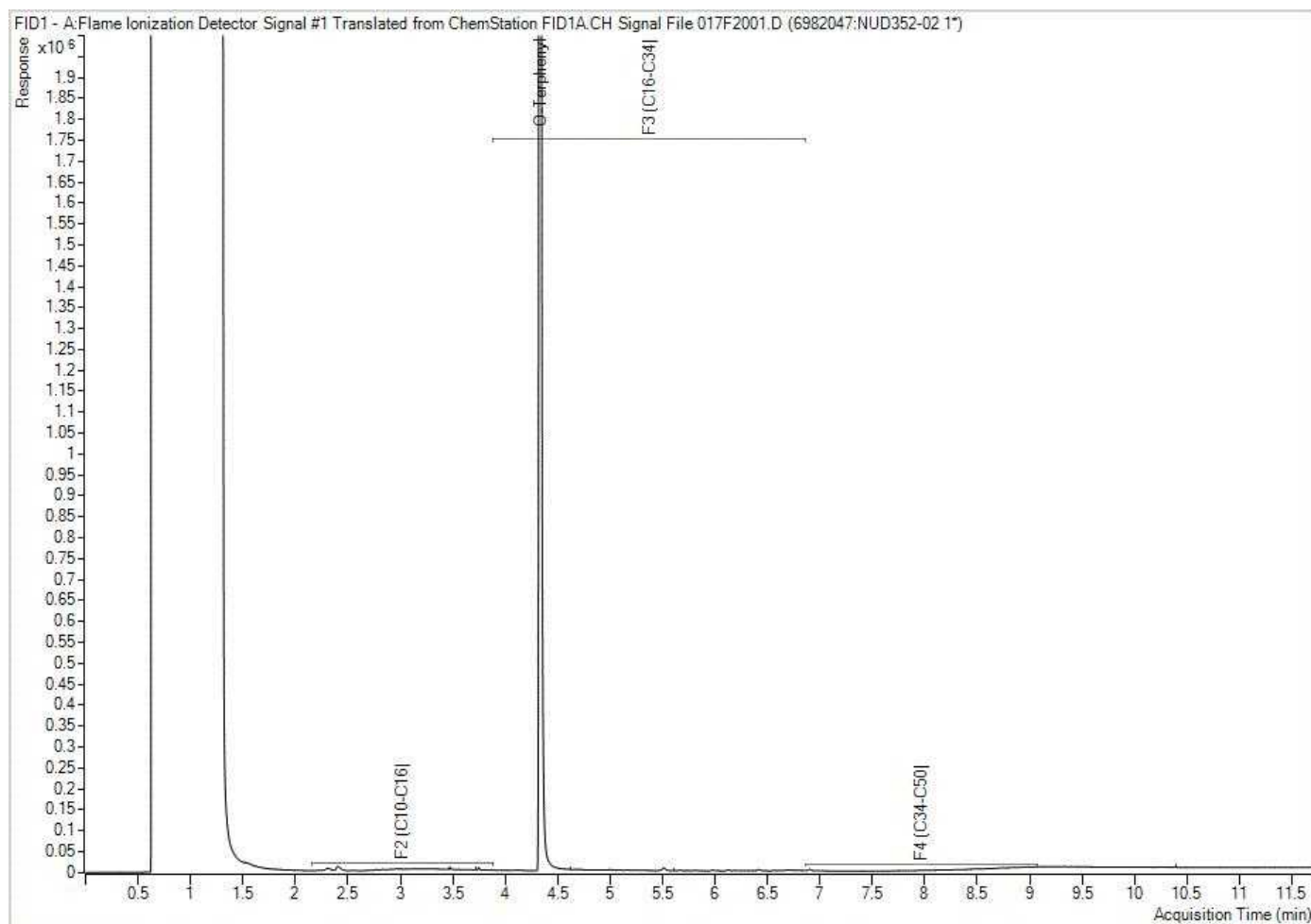


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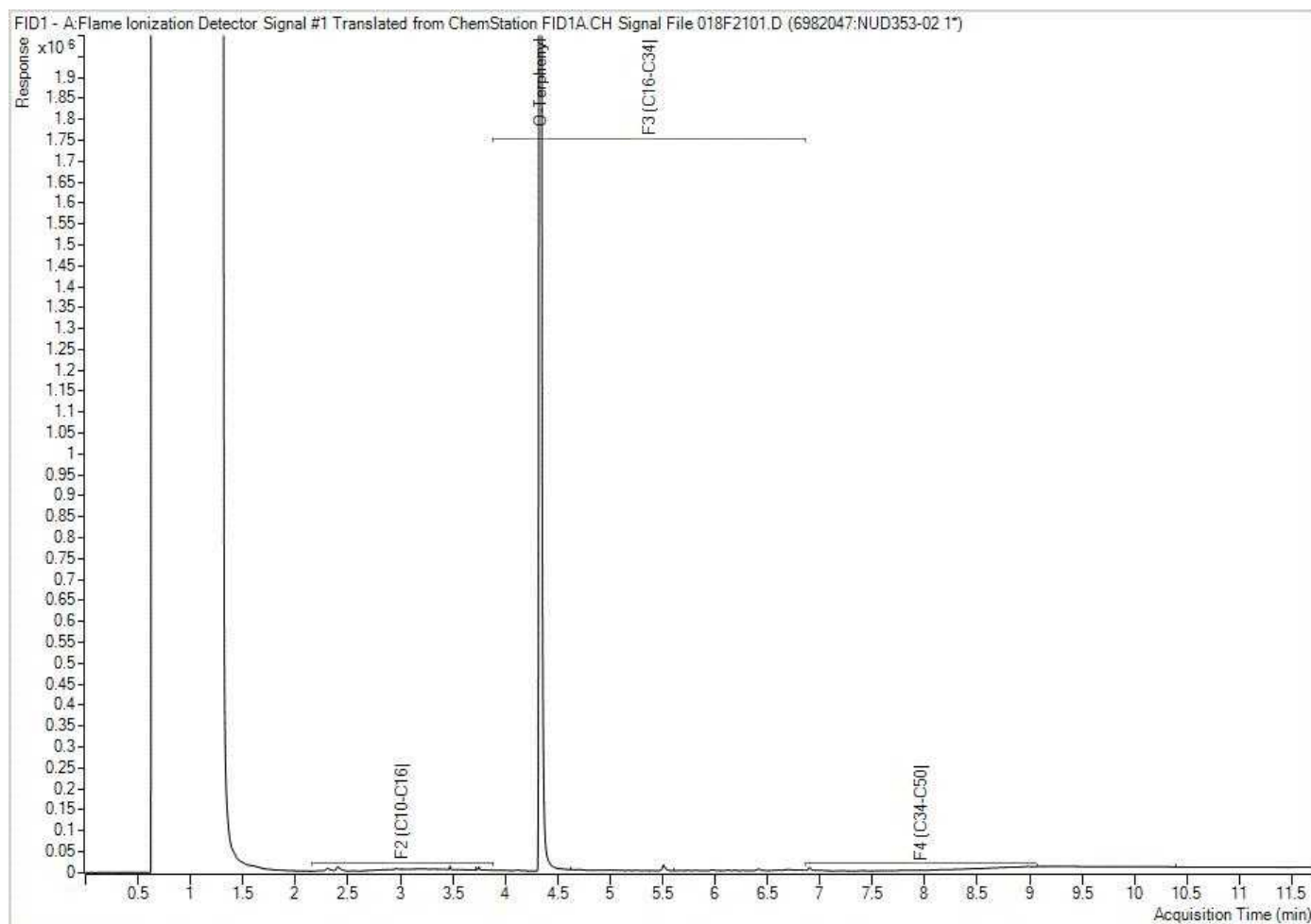
ENV-997

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

**Solicitation No. 5P201-20-0104**

**North East Trail: Rouge National Urban Park  
Parks Canada**

## **APPENDIX B**

# **Hazard Tree Inventory**

**Inventory of Trees**  
**– NE Trails –**  
**Rouge National Urban Park, Ontario**



Dillon Tag	Scientific Name	Common Name	X Coordinates	Y Coordinates	DBH (cm)	Hazard	Condition	Recommendation	Location re: Limit of Work	Comments
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<b>SECTION 1</b>										
<b>Starting at NE corner of Sideline 34 and Concession Rd. 8</b>										
714	<i>Fraxinus pennsylvanica</i>	Green Ash	644268.9253	4866546.327	25 + 25	Yes	Dead	Remove	Outside	
715	<i>Fraxinus pennsylvanica</i>	Green Ash	644268.2656	4866548.902	45	Yes	Dead	Remove	Outside	
716	<i>Fraxinus pennsylvanica</i>	Green Ash	644264.9599	4866561.999	30 + 20 + 25	Yes	Dead	Remove	Outside	
717	<i>Fraxinus pennsylvanica</i>	Green Ash	644261.5118	4866567.563	45	Yes	Dead	Remove	Outside	
718	<i>Acer saccharum</i>	Sugar Maple	644215.5045	4866706.202	58	Yes	Poor	Prune	Outside	Prune dead branches overhanging trail
719	<i>Fraxinus pennsylvanica</i>	Green Ash	644232.7242	4866884.05	28	Yes	Dead	Remove	Within	
780	<i>Fraxinus americana</i>	White Ash	643992.5321	4867331.232	100	Yes	Dead	Convert to Perch	Outside	Convert to wildlife habitat perch by cutting top off at 6m above ground, chip and scatter removals in surrounding forested areas within PCA property.
836	<i>Ulmus americana</i>	American Elm	644018.7599	4867365.142	20	Yes	Dead	Remove	Within	
793	<i>Ulmus americana</i>	American Elm	643966.6159	4867539.387	36	Yes	Dead	Remove	Outside	
794	<i>Ulmus americana</i>	American Elm	644063.4448	4867572.479		Yes	Dead	Remove	Outside	
795	<i>Pinus sylvestris</i>	Scotch Pine	644079.7839	4867594.994	32	Yes	Dead	Remove	Within	
796	<i>Ulmus americana</i>	American Elm	644081.6524	4867596.384	18	Yes	Poor	Remove	Within	
797	<i>Pinus sylvestris</i>	Scotch Pine	644079.5804	4867600.154	20	Yes	Dead	Remove	Outside	
798	<i>Pinus sylvestris</i>	Scotch Pine	644079.6152	4867599.81	16	Yes	Dead	Remove	Outside	
799	<i>Pinus sylvestris</i>	Scotch Pine	644082.0856	4867600.187	20	Yes	Dead	Remove	Within	
800	<i>Pinus sylvestris</i>	Scotch Pine	644082.6973	4867602.491		Yes	Dead	Remove	Within	
801	<i>Fraxinus americana</i>	White Ash	644093.406	4867617.967	85	Yes	Dead	Prune	Outside	Prune dead branches overhanging trail
802	<i>Thuja occidentalis</i>	Eastern White Cedar	644120.2151	4867670.308	50 + 50	Yes	Poor	Remove	Within	
803	<i>Ulmus americana</i>	American Elm	644120.1248	4867669.394	27	Yes	Dead	Remove	Within	
804	<i>Ulmus americana</i>	American Elm	644117.194	4867670.827	30	Yes	Dead	Remove	Within	On other side of fenceline
805	<i>Ulmus americana</i>	American Elm	644114.9139	4867684.98	25	Yes	Dead	Remove	Within	
806	<i>Ulmus americana</i>	American Elm	644113.1416	4867692.666	16	Yes	Dead	Remove	Within	
807	<i>Populus tremuloides</i>	Trembling Aspen	644109.5168	4867709.696	14	Yes	Dead	Remove	Within	
808	<i>Fraxinus pennsylvanica</i>	Green Ash	644108.825	4867724.123	15	No	Poor	Remove	Within	
809	<i>Populus tremuloides</i>	Trembling Aspen	644116.085	4867744.083	13	Yes	Dead	Remove	Within	
810	<i>Ulmus americana</i>	American Elm	644118.3595	4867747.382	17	Yes	Dead	Remove	Within	
811	<i>Pinus resinosa</i>	Red Pine	644124.4868	4867841.681	17	No	Dead	Remove	Within	
812	<i>Fraxinus pennsylvanica</i>	Green Ash	644144.885	4867877.196	13	Yes	Dead	Remove	Outside	

Dillon Tag	Scientific Name	Common Name	X Coordinates	Y Coordinates	DBH (cm)	Hazard	Condition	Recommendation	Location re: Limit of Work	Comments
813	<i>Fraxinus pennsylvanica</i>	Green Ash	644208.8131	4868004.573	27	Yes	Dead	Remove	Within	
814	<i>Tilia americana</i>	American Basswood	644213.8287	4868016.201	20 + 15	No	Fair	Remove	Within	
815	<i>Fraxinus pennsylvanica</i>	Green Ash	644192.184	4868078.517	30	Yes	Dead	Remove	Outside	
816	<i>Fraxinus pennsylvanica</i>	Green Ash	644187.5981	4868082.283	30	Yes	Dead	Remove	Within	
817	<i>Fraxinus pennsylvanica</i>	Green Ash	644188.0304	4868082.576	21	Yes	Dead	Remove	Within	
818	<i>Acer saccharum</i>	Sugar Maple	644173.0005	4868108.351	60	Yes	Dead	Remove	Outside	
819	<i>Acer saccharum</i>	Sugar Maple	644175.7391	4868110.797	62	Yes	Poor	Monitor	Outside	Cavity observed high up with crack progressing down trunk. Potential hazard tree as this structural defect will worsen over time. Recommend monitoring or removal.
740	<i>Pinus strobus</i>	Eastern White Pine	644182.2996	4868124.093	60	No	Good	Retain	Outside	Retain for seating area
741	<i>Tilia americana</i>	American Basswood	644184.1826	4868120.325	34 + 31 + 21	No	Good	Retain	Outside	Retain for seating area
742	<i>Fraxinus americana</i>	White Ash	644171.6008	4868161.236	31 + 20	Yes	Dead	Prune	Outside	Convert to wildlife habitat perch by cutting top off at 6m above ground, chip and scatter removals in surrounding forested areas within PCA property. Prune dead secondary branches overhanging trail.
743	<i>Fraxinus americana</i>	White Ash	644141.147	4868254.5	55	Yes	Dead	Remove	Outside	
744	<i>Unknown</i>		644123.1888	4868308.889	45	Yes	Dead	Remove	Outside	
907	<i>Unknown</i>				40	Yes	Dead	Convert to Perch	Outside	Convert to wildlife habitat perch by cutting top off at 6m above ground, chip and scatter removals in surrounding forested areas within PCA property. Prune dead secondary branches overhanging trail.
SECTION 2										
North of Concession Rd. 9/Durham Rd. 5										
749	<i>Unknown</i>		643746.1307	4868633.426	32	Yes	Dead	Remove	Outside	
750	<i>Pinus strobus</i>	Eastern White Pine	643827.9693	4869322.259	17	Yes	Dead	Remove	Outside	
751	<i>Fraxinus pennsylvanica</i>	Green Ash	644154.8429	4869533.649	26 + 25	Yes	Dead	Remove	Within	
752	<i>Fraxinus pennsylvanica</i>	Green Ash	644159.4595	4869541.756	21	Yes	Dead	Remove	Outside	
East of Sideline 32										
753	<i>Fraxinus pennsylvanica</i>	Green Ash	644176.9561	4869531.907	34	Yes	Dead	Remove	Outside	
754	<i>Fraxinus americana</i>	White Ash	644194.8102	4869564.075	18	Yes	Dead	Remove	Just Outside	
755	<i>Fraxinus americana</i>	White Ash	644279.4557	4869578.224	46	Yes	Dead	Convert to Perch	Outside	Convert to wildlife habitat perch by cutting top off at 6m above ground, chip and scatter removals in surrounding forested areas within PCA property.
756	<i>Unknown</i>		644303.0375	4869593.597	46	Yes	Dead	Remove	Within	
757	<i>Acer saccharum</i>	Sugar Maple	644303.8306	4869596.077	36 + 28	No	Fair	Monitor	Outside	Structural defect by woodpecker hole, future hazard
758	<i>Fagus grandifolia</i>	American Beech	644322.2095	4869588.509		Yes	Poor	Remove	Within	Beech bark disease
759	<i>Fagus grandifolia</i>	American Beech	644324.0893	4869588.636		Yes	Dead	Remove	Within	Beech bark disease
760	<i>Fagus grandifolia</i>	American Beech	644326.6264	4869590.255	25	Yes	Dead	Remove	Within	Beech bark disease

Dillon Tag	Scientific Name	Common Name	X Coordinates	Y Coordinates	DBH (cm)	Hazard	Condition	Recommendation	Location re: Limit of Work	Comments
761	<i>Populus tremuloides</i>	Trembling Aspen	644422.3899	4869617.862	36	No	Good	Prune	Within	Remove buttress roots where in conflict with boardwalk structure
762	<i>Fraxinus americana</i>	White Ash	644500.0359	4869629.773	41	Yes	Dead	Remove	Within	
763	<i>Fagus grandifolia</i>	American Beech	644524.7911	4869656.638	62	Yes	Dead	Remove	Outside	
834	<i>Acer saccharum</i>	Sugar Maple	644516.1742	4869672.146	68	Yes	Poor	Remove	Within	Extensive decay at base
835	<i>Acer saccharum</i>	Sugar Maple	644550.93	4869697.761	75	Yes	Poor	Remove	Within	Large cavity at 2m with extensive decay, potential bat habitat
764	<i>Fraxinus pennsylvanica</i>	Green Ash	644715.8906	4869761.911	18	Yes	Dead	Remove	Within	
765	<i>Fraxinus pennsylvanica</i>	Green Ash	644715.5556	4869764.767	45	Yes	Dead	Remove	Within	
766	<i>Fraxinus americana</i>	White Ash	644704.4537	4869871.225	89	Yes	Dead	Prune	Outside	Convert to wildlife habitat perch by cutting top off at 6m above ground, chip and scatter removals in surrounding forested areas within PCA property. Prune dead secondary branches overhanging trail.
767	<i>Fraxinus americana</i>	White Ash	644687.3922	4869928.468	43	Yes	Dead	Remove	Outside	
768	<i>Fraxinus pennsylvanica</i>	Green Ash	644682.4711	4869935.893	37	Yes	Dead	Remove	Outside	
769	<i>Fraxinus pennsylvanica</i>	Green Ash	644679.0536	4869960.651	35	Yes	Dead	Remove	Outside	Cluster of 3 trees to remove
770	<i>Fraxinus americana</i>	White Ash	644675.2784	4869970.81	50	Yes	Dead	Remove	Outside	
771	<i>Acer saccharum</i>	Sugar Maple	644629.3851	4870710.322	87	Yes	Poor	Remove	Within	
772	<i>Fraxinus americana</i>	White Ash	644635.6786	4870711.814	45 x 4	Yes	Dead	Remove	Outside	
720	<i>Abies alba</i>	Silver Fir	644615.684	4870791.208	60	Yes	Dead	Remove	Outside	Within ROW
SECTION 3										
North of Uxbridge Pickering Townline										
903	<i>Juglans nigra</i>	Black Walnut			76	No	Poor	Monitor	Outside	PROVISIONAL - Cavity observed in stem with co-dominant branching overhanging power line, needs risk assessment and monitoring
904	<i>Juglans nigra</i>	Black Walnut			70	No	Fair	Retain	Outside	Along section of trail provisional in scope
829	<i>Acer negundo</i>	Manitoba Maple	644822.2509	4871007.857	57	Yes	Poor	Remove	Outside	Large cavity observed at 5m, structural defect
830	<i>Acer negundo</i>	Manitoba Maple	644823.7752	4871009.78	55	Yes	Poor	Remove	Within	Overhanging trail, structurally compromised
831	<i>Acer negundo</i>	Manitoba Maple	644816.2172	4871019.52	40	No	Fair	Monitor	Outside	Potential hazard - may be uprooting but can't confirm due to snow cover. Other trees adjacent are uprooting. Monitor
821	<i>Malus pumila</i>	Common Apple	644876.9611	4871126.579	45	No	Poor	Prune	Within	Prune dead secondary branches overhanging trail
832	<i>Populus tremuloides</i>	Trembling Aspen	644841.4679	4871184.899	36	No	Fair	Remove	Within	In way of trail. Potential hazard - can't see if uprooting is an issue due to snow cover
833	<i>Populus tremuloides</i>	Trembling Aspen	644823.1275	4871228.735	39	No	Poor	Monitor	Just Outside	Large closed wound with peeling bark observed at 1m to 4m
822	<i>Ulmus americana</i>	American Elm	644911.4509	4871330.748	40	Yes	Dead	Convert to Perch	Outside	Convert to wildlife habitat perch by cutting top off at 6m above ground, chip and scatter removals in surrounding forested areas within PCA property.
823	<i>Betula alleghaniensis</i>	Yellow Birch	644919.4386	4871347.612	45	Yes	Dead	Remove	Just Outside	

Dillon Tag	Scientific Name	Common Name	X Coordinates	Y Coordinates	DBH (cm)	Hazard	Condition	Recommendation	Location re: Limit of Work	Comments
824	<i>Tilia americana</i>	American Basswood	644648.8668	4872055.833	70	No	Fair	Monitor	Outside	Significant lean observed, roots uprooting suspected due to erosion but unable to confirm due to snow in way
825	<i>Unknown</i>		644669.5887	4872058.536	18	Yes	Dead	Remove	Outside	Leaning over trail
901	<i>Prunus serotina</i>	Wild Black Cherry			41	No	Fair	Remove	Outside	
827	<i>Fraxinus americana</i>	White Ash	644680.3538	4872135.364		Yes	Poor	Prune	Outside	Prune dead branches overhanging trail
214	<i>Populus balsamifera</i>	Balsam Poplar	644514.3419	4872489.117	25	Yes	Dead	Remove	Outside	
215	<i>Pinus banksiana</i>	Jack Pine	644541.9639	4872510.014	20	Yes	Dead	Remove	Within	
216	<i>Acer negundo</i>	Manitoba Maple	644538.842	4872503.945	15	Yes	Dead	Remove	Outside	
217	<i>Pinus banksiana</i>	Jack Pine	644536.0853	4872527.691	20	Yes	Dead	Remove	Within	
218	<i>Malus sargentii</i>	Crab Apple	644532.3885	4872527.103	64	Yes	Poor	Remove	Within	Lots of cracks observed in the bark
219	<i>Pinus banksiana</i>	Jack Pine	644504.0355	4872606.078	27	Yes	Dead	Remove	Within	
220	<i>Betula minor</i>	Dwarf White Birch	644442.0278	4872609.063	30	Yes	Dead	Remove	Outside	3 fallen trees are over taking other cedars and are overhanging the trail
221	<i>Thuja occidentalis</i>	Eastern White Cedar	644429.6111	4872606.229		Yes	Dead	Remove	Within	
222	<i>Thuja occidentalis</i>	Eastern White Cedar	644425.6835	4872607.089		Yes	Dead	Remove	Outside	
223	<i>Thuja occidentalis</i>	Eastern White Cedar	644403.962	4872604.702	15 + 20	Yes	Dead	Remove	Within	
224	<i>Thuja occidentalis</i>	Eastern White Cedar	644399.0389	4872597.545	28 + 18	Yes	Dead	Remove	Within	
225	<i>Thuja occidentalis</i>	Eastern White Cedar	644398.2943	4872591.819	20 + 23 + 22	Yes	Dead	Remove	Outside	2 trees to remove
226	<i>Populus deltoides ssp. Deltoides</i>	Eastern Cottonwood	644388.3867	4872590.275	52	Yes	Dead	Remove	Outside	
227	<i>Populus deltoides ssp. Deltoides</i>	Eastern Cottonwood	644368.2944	4872585.152	31	Yes	Dead	Remove	Within	
228	<i>Populus tremuloides</i>	Trembling Aspen	644355.3893	4872578.163	28	Yes	Dead	Remove	Within	
229	<i>Populus tremuloides</i>	Trembling Aspen	644339.4527	4872572.05	29	Yes	Dead	Remove	Within	
230	<i>Unknown</i>		644338.4893	4872574.236	26	Yes	Dead	Remove	Within	
231	<i>Populus deltoides ssp. Deltoides</i>	Eastern Cottonwood	644310.8284	4872577.267	76	Yes	Poor	Remove	Outside	5m inwards 16 in total to be removed. Convert a select few to perch
SECTION 4										
Coyote Trail Starting at Glasgow Parking Lot										
204	<i>Acer negundo</i>	Manitoba Maple	644084.6452	4872544.354	38 + 28	Yes	Dead	Remove	Outside	7m from trail
233	<i>Pinus resinosa</i>	Red Pine	644083.3386	4872569.863	range 20 to 32	Yes	Dead	Remove	Outside	Remove 16 dead pines in this area
235	<i>Pinus strobus</i>	Eastern White Pine	644075.1424	4872622.215	36	Yes	Dead	Remove	Within	
236	<i>Pinus resinosa</i>	Red Pine	644087.4028	4872633.864	17	Yes	Dead	Remove	Within	
237	<i>Pinus resinosa</i>	Red Pine	644090.5869	4872645.374	32	Yes	Dead	Remove	Outside	7 in poor health to remove
238	<i>Fraxinus americana</i>	White Ash	644088.8969	4872675.585		Yes	Dead	Remove	Within	
239	<i>Pinus resinosa</i>	Red Pine	644097.7697	4872688.312	22	Yes	Dead	Remove	Outside	Located along ex. Coyote Trail, but outside new trail limits
240	<i>Pinus resinosa</i>	Red Pine	644105.1027	4872689.108	23	Yes	Dead	Remove	Outside	

Dillon Tag	Scientific Name	Common Name	X Coordinates	Y Coordinates	DBH (cm)	Hazard	Condition	Recommendation	Location re: Limit of Work	Comments
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**Notes:** (1) Species identification numbers are as per Dillon's various field visits on September 18, 2019; September 27, 2019; October 3, 2019; October 25, 2019; November 12, 2019; November 14, 2019; January 22, 2020; and July 6, 2020.  
(2) DBH = Diameter at breast height  
(3) Diameter at breast height is as per Dillon field dates noted above.

Definitions:

**Hazard Tree** - the specimen tree is considered dead or has no living tissue. The specimen tree could pose a hazard to people or property. These trees have the potential for splitting, breaking and/or falling over during inclement weather, and because of their proximity to the municipal trail or parkland, could cause personal injury and/or severe damage to municipal infrastructure and/or private property.

**Poor condition** – The specimen tree shows major symptoms of decline. At least 50% of main scaffold branches are dead, missing or in diseased state. Trunk shows evidence of advanced rot or is hollow throughout. New growth on main branches or through sucker development is limited. Callus growth around wounds is minimal. A tree in poor condition is considered a safety hazard in an area with high pedestrian traffic and should be removed prior to development.

**Fair Condition** – The specimen tree shows moderate symptoms of decline in lower canopy of scaffold branches, but at least 75% of scaffold branches are present and viable. Trunk shows limited evidence of rot or insect damage. Callus growth is present near wound areas. Trees that have scaffold branches that are healthy but are in a “Y” formation are also included in this category due to the risk of splitting or breakage as the tree matures. Removal or preservation of these trees depends on each situation and would depend on the species and its tolerance to grading and surviving in an urban environment. Some major arboricultural maintenance would be required in the future and may include major scaffold or secondary branch removal, bracing and/cabling.

**Good Condition** – The specimen tree shows no symptoms of decline in trunk, and all scaffold branches are present and are in good condition. Most scaffold branches are at right angles to the trunk, and show good vigour. Small amounts of dead wood are present in secondary branches, but account for less than 10% of the canopy. Depending on the grading in the immediate area, a tree in good condition would be recommended for preservation. Such a tree would survive to maturity without major arboricultural maintenance.

**Excellent Condition** – The specimen tree shows no symptoms of decline in trunk, scaffold or secondary branches. Tree has excellent habit and should survive to maturity without major arboriculture maintenance.

Legend	
	Trees to be Monitored
	Trees to be Pruned/Converted to Wildlife Perch
	Trees to be Removed Within the Trail Corridor
	Trees to be Removed Outside the Trail Corridor
	Provisional Tree Removals

**Inventory of Butternut Trees**  
**– NE Trails –**  
**Rouge National Urban Park, Ontario**



Dillon Tag	Scientific Name	Common Name	X Coordinates	Y Coordinates	DBH (cm)	Height (m)	Hazard	Condition	Canker Extent	Category	Recommendation	Location re: Limit of Work	Comments
<b>SECTION 2</b>													
1	<i>Juglans cinerea</i>	Butternut	644542.4472	4869672.694			No	Poor			Retain	Outside	95% live crown , canker, potential hazard, trail rerouted to avoid
33	<i>Juglans cinerea</i>	Butternut	644559.1422	4869720.323			No	Fair			Retain	Outside	Trail rerouted to avoid
<b>SECTION 3</b>													
2	<i>Juglans cinerea</i>	Butternut	644779.8269	4870953.499	10						Retain	Outside	Trail rerouted to avoid
30	<i>Juglans cinerea</i>	Butternut	644798.6762	4870993.128	5		No	Good			Retain	Outside	Trail rerouted to avoid
31	<i>Juglans cinerea</i>	Butternut	644798.028	4870992.639	3		No	Good			Retain	Outside	Callused wound, trail rerouted to avoid
<b>SECTION 4</b>													
3	<i>Juglans cinerea</i>	Butternut	644410.0993	4872389.562	4+3		No	Good	None	-	Retain	Outside	Multi-stemmed
4	<i>Juglans cinerea</i>	Butternut	644203.6514	4872510.305	10+6		No	Fair to Good	Minimal	-	Retain	Outside	Multi-stemmed
5	<i>Juglans cinerea</i>	Butternut	644203.8094	4872526.183	4+1		No	Fair to Good	None	2	Retain	Outside	Multi-stemmed, Two stems growing from an old stump
6	<i>Juglans cinerea</i>	Butternut	644203.6592	4872526.239	3		No	Good	None	1	Retain	Outside	
7	<i>Juglans cinerea</i>	Butternut	644201.7826	4872524.511	10		No	Fair	Moderate	1	Retain	Outside	
8	<i>Juglans cinerea</i>	Butternut	644200.5609	4872522.069	2		No	Good	None	2	Retain	Outside	
9	<i>Juglans cinerea</i>	Butternut	644206.1736	4872531.25	4+3		No	Good	None	2	Retain	Outside	
10	<i>Juglans cinerea</i>	Butternut	644205.4349	4872541.94	2		No	Fair to Good	Minimal	1	Retain	Outside	
11	<i>Juglans cinerea</i>	Butternut	644193.336	4872540.478	13+6+6		No	Fair	Moderate	1	Retain	Outside	
12	<i>Juglans cinerea</i>	Butternut	644190.5213	4872546.267	10		No	Fair to Good	Minimal	2	Retain	Outside	
13	<i>Juglans cinerea</i>	Butternut	644194.2437	4872549.729	12		No	Fair to Good	Minimal	2	Retain	Outside	
14	<i>Juglans cinerea</i>	Butternut	644189.0263	4872553.041	8		No	Good	None	2	Retain	Outside	
15	<i>Juglans cinerea</i>	Butternut	644178.2216	4872572.002	6		No	Good	None	2	Retain	Outside	
16	<i>Juglans cinerea</i>	Butternut	644178.0531	4872564.746	7		No	Dead	Dead	-	Retain	Outside	Tree is Dead, fruiting bodies along length of stem
17	<i>Juglans cinerea</i>	Butternut	644126.4149	4872560.349	43 + 29		No	Poor	Extensive	3 + 1	Retain	Outside	Multi-stemmed, Dieback of secondary branches observed within the crown
18	<i>Juglans cinerea</i>	Butternut	644110.8356	4872535.987	7		No	Fair to Poor	Extensive	-	Retain	Outside	
19	<i>Juglans cinerea</i>	Butternut	644108.8932	4872533.871	6		No	Fair	Moderate	1	Retain	Outside	
20	<i>Juglans cinerea</i>	Butternut	644110.1261	4872532.389	9		No	Good	Minor	2 + 1	Retain	Outside	
21	<i>Juglans cinerea</i>	Butternut	644102.6305	4872537.874	8		No	Good	None	2	Retain	Outside	
22	<i>Juglans cinerea</i>	Butternut	644054.3738	4872522.052	4		No	Good	None	2	Retain	Outside	In berm in parking lot
23	<i>Juglans cinerea</i>	Butternut	644076.0015	4872524.932	3		No	Good	None	1	Retain	Outside	
24	<i>Juglans cinerea</i>	Butternut	644081.9104	4872535.628	2		No	Fair	Moderate	1	Removal	Outside	
25	<i>Juglans cinerea</i>	Butternut	644083.9942	4872573.871	3		No	Dead	Minimal		Removal	Just Outside	Poor live buds present
26	<i>Juglans cinerea</i>	Butternut	644076.3779	4872572.161	3		No	Fair to Good	Minimal	1	Retain	Outside	Twig die-back with lots of calloused wounds
27	<i>Juglans cinerea</i>	Butternut	644095.0904	4872514.002	1		No	Fair	Moderate	2	Retain	Outside	
28	<i>Juglans cinerea</i>	Butternut	644096.2563	4872508.671	1		No	Fair	Moderate	2	Retain	Outside	
29	<i>Juglans cinerea</i>	Butternut	644100	4872507	3		No	Poor	Moderate	1	Retain	Outside	Live bud count was poor with healthy buds observed on only one stem. Stem is very callused. Live crown likely < 50%.
32	<i>Juglans cinerea</i>	Butternut	644104	4872497	4		No	Fair to Poor	Extensive	1	Retain	Outside	Large open wound at 30cm.
34	<i>Juglans cinerea</i>	Butternut	644112.9999	4872489.006	2		No	Good	None	1	Retain	Outside	Good live bud count.

35	<i>Juglans cinerea</i>	Butternut	644117	4872487	1		No	Good	None	1	Retain	Outside	
36	<i>Juglans cinerea</i>	Butternut	644121	4872497	6+3		No	Poor	Extensive	1	Retain	Outside	Multi-stemmed.
37	<i>Juglans cinerea</i>	Butternut	644120.6778	4872504.392	3		No	Poor	Extensive	1	Retain	Outside	Main canopy/stem is dead, 3 new live stems originating from stump of the old tree
38	<i>Juglans cinerea</i>	Butternut	644084	4872459	3		No	Good	None	2	Retain	Outside	
39	<i>Juglans cinerea</i>	Butternut	644070.9978	4872467.101	1	0.6	No	Fair to Good	Minimal	-	Removal	Within	Sapling
40	<i>Juglans cinerea</i>	Butternut	644086.3783	4872446.996	1	0.9	No	Fair to Good	Minimal	2	Retain	Outside	Sapling
41	<i>Juglans cinerea</i>	Butternut	644093.5492	4872429.05	17		No	Poor	Extensive		Retain	Outside	Tree has fallen over and the original base appears to have started to decay but was obscured by deep snow. New live shoots have re-rooted along the former trunk. Large areas of sooty patches were observed on new shoots
42	<i>Juglans cinerea</i>	Butternut	644128.5898	4872428.923	10+7		No	Good	None	2	Retain	Outside	
43	<i>Juglans cinerea</i>	Butternut	644124.6268	4872458.772	1	0.9-1.2	No	Fair to Good	Minimal	2	Retain	Outside	Sapling
44	<i>Juglans cinerea</i>	Butternut	644066.2697	4872552.461	2+3		No	Poor	Moderate	1	Retain	Outside	Tree almost dead with live buds only observed on one branch
45	<i>Juglans cinerea</i>	Butternut	644051.3918	4872542.196	11		No	Fair to Poor	Extensive	1	Retain	Outside	
46	<i>Juglans cinerea</i>	Butternut	644180.1373	4872565.782	3		No	Good	None	2	Retain	Outside	
47	<i>Juglans cinerea</i>	Butternut	644196.343	4872542.238	9		No	Dead	Dead	-	Retain	Outside	No live buds were observed
48	<i>Juglans cinerea</i>	Butternut	644206.251	4872542.636	2		No	Good	None	2	Retain	Outside	Sapling
49	<i>Juglans cinerea</i>	Butternut	644206.9628	4872541.25	1	0.9	No	Good	None	2	Retain	Outside	Sapling
50	<i>Juglans cinerea</i>	Butternut	644218.8369	4872581.244	3+2		No	Fair	Moderate	1	Retain	Outside	Multi-stemmed
51	<i>Juglans cinerea</i>	Butternut	644217.3657	4872582.638	3		No	Fair to Good	Minimal	2	Retain	Outside	
52	<i>Juglans cinerea</i>	Butternut	644230.8417	4872597.081	5		No	Fair to Good	Minimal	2	Retain	Outside	
53	<i>Juglans cinerea</i>	Butternut	644260.5719	4872622.353	4		No	Good	None	2	Retain	Just Outside	
54	<i>Juglans cinerea</i>	Butternut	644311.192	4872569.47	4		No	Good	None	2	Retain	Outside	
55	<i>Juglans cinerea</i>	Butternut	644508.4536	4872629.149	9		No	Fair to Good	Minimal	1	Retain	Outside	
56	<i>Juglans cinerea</i>	Butternut	644511.5878	4872625.506	13		No	Fair to Good	Minimal	2	Retain	Outside	
57	<i>Juglans cinerea</i>	Butternut	644518.4037	4872629.674	11		No	Fair to Poor	Extensive	1	Retain	Outside	
58	<i>Juglans cinerea</i>	Butternut	644328.481	4872579.18	1	0.9	No	Good	None	2	Retain	Outside	Sapling
59	<i>Juglans cinerea</i>	Butternut	644094.3931	4872685.841	5		No	Fair to Poor	Extensive	1	Remove	Outside	
60	<i>Juglans cinerea</i>	Butternut	644071.1653	4872613.491	3		No	Fair	Moderate	1	Remove	Just Outside	
210	<i>Juglans cinerea</i>	Butternut	644296.0404	4872425.271	40		Yes	Dead	Dead	-	Removed		TRCA removed on 2020.03.09

- Notes:** (1) Species identification numbers are as per Dillon's field date on March 9, 2020.
- (2) DBH = Diameter at breast height
- (3) Diameter at breast height is as per Dillon field dates (March 9, 2020).
- (4) Refer to Forest Gene Conservation Authority's (FGCA) Butternut Health Assessment Report dated in June 2020 for Area 1 within the Rouge National Urban Park in Pickering for a complete Butternut Health Assessment of these trees.

Definitions:

**Hazard Tree** - the specimen tree is considered dead or has no living tissue. The specimen tree could pose a hazard to people or property. These trees have the potential for splitting, breaking and/or falling over during inclement weather, and because of their proximity to the municipal trail or parkland, could cause personal injury and/or severe damage to municipal infrastructure and/or private property.

**Poor condition** – The specimen tree shows major symptoms of decline. At least 50% of main scaffold branches are dead, missing or in diseased state. Trunk shows evidence of advanced rot or is hollow throughout. New growth on main branches or through sucker development is limited. Callus growth around wounds is minimal. A tree in poor condition is considered a safety hazard in an area with high pedestrian traffic and should be removed prior to development.

**Fair Condition** – The specimen tree shows moderate symptoms of decline in lower canopy of scaffold branches, but at least 75% of scaffold branches are present and viable. Trunk shows limited evidence of rot or insect damage. Callus growth is present near wound areas. Trees that have scaffold branches that are healthy but are in a “Y” formation are also included in this category due to the risk of splitting or breakage as the tree matures. Removal or preservation of these trees depends on each situation and would depend on the species and its tolerance to grading and surviving in an urban environment. Some major arboricultural maintenance would be required in the future and may include major scaffold or secondary branch removal, bracing and/cabling.

**Good Condition** – The specimen tree shows no symptoms of decline in trunk, and all scaffold branches are present and are in good condition. Most scaffold branches are at right angles to the trunk, and show good vigour. Small amounts of dead wood are present in secondary branches, but account for less than 10% of the canopy. Depending on the grading in the immediate area, a tree in good condition would be recommended for preservation. Such a tree would survive to maturity without major arboricultural maintenance.

**Excellent Condition** – The specimen tree shows no symptoms of decline in trunk, scaffold or secondary branches. Tree has excellent habit and should survive to maturity without major arboriculture maintenance.

Legend	
<div></div>	Trees to be Removed Within the Trail Corridor
<div></div>	Butternuts to be Removed

**Solicitation No. 5P201-20-0104**

**North East Trail: Rouge National Urban Park  
Parks Canada**

## **APPENDIX C**

# **Butternut BHA Assessment Report**

## **FGCA Report on butternut assessments in selected areas in Rouge National Urban Park**

Terry Schwan, BHA #022, R.P.F.

June 2020

Butternut Health Assessments were conducted on previously identified purported butternut (*Juglans cinerea*) at four locations in Rouge National Urban Park (RNUP), in May and June 2020. Properties were in Toronto, York (Markham) and Durham Regions (Uxbridge and Pickering).

### **Locations & RNUP data**

Area 1 – Concession 2 and Webb Road, Uxbridge

Area 2 – 8<sup>th</sup> Concession and Sideline 34, Pickering

Area 3 – 7277 14<sup>th</sup> Ave, Markham; Bob Hunter Memorial Park

Area 4 – 7937 Steeles Ave East, Toronto

At Area 1, data was provided for 55 trees, or multi-stemmed trees. The trees were inventoried by Dillon Consulting in 2019. Five other trees were included in the RNUP database but were at different nearby areas, and so not viewed or assessed. Information from the database included UTM coordinates, diameter, height if less than dbh, hazard, condition, canker extent, recommendations, and comments. Trees were numbered with paint or with flagging tape for the smallest tress.

At Area 2, 37 data points were provided. Eight trees were observed in 2003 and these were NHIC processed and linked to EO. Observation details include counts of more than one individual. The ID number was six digits. There were 28 trees observed in 2011; only a few had notes about health. They had a three-digit ID. One tree was observed in 2017. All trees had coordinates; no diameters available. On some of the 2011 observations, paint was still legible on the tree.

At Area 3, 15 data points were provided with ID number, observed date, count of trees at point, coordinates, and observation details. These details had a different observation number and were NHIC processed and linked to EO. Thirteen of the data points were observed in 2002, one in 2013 and one in 2019. Trees were not numbered nor diameters available.

At Area 4, there were nine trees with an ID number, observed in Nov. 2019, and two trees without number observed in March 2020. Observation details included estimated dbh with number of trees, all assessed as poor, and that leaf drop had occurred. Coordinates were provided and but there were no numbers on trees.

**Variance from Field Inventory as described in ToR May 27, 2020 (not included here) and email from Julian Skuza to Terry Schwan of May 21, 2020**

- 1) Identification of pure vs hybrid individuals
- 2) All pure individuals are marked with permanent tree tags (provided by RNUP) and all hybrids are marked with tree paint and will be scheduled for removal
- 3) All pure butternuts will have a BHA completed
- 4) Locations data collected from each tree and all BHAs will be provided to RNUP

All trees were numbered with tube paint or tags whether pure or hybrid. Trees smaller than one cm had a metal numbered tag attached. These small trees were found only on Area 1. All others were marked with tube paint. All trees, where pure vs. hybrid could not be determined, had a BHA completed. Only trees on Area 2 determined to be hybrid were marked with a large red X. Thinning regime recommendation to open the canopy are not provided.

**Observations**

Terry Schwan conducted tree assessments using the Ontario ESA BHA Assessment System based on the 'BUTTERNUT ASSESSMENT GUIDELINES Assessment of Butternut Tree Health for the Purposes of the Endangered Species Act, 2007 May 2011 Amended: December 2014 (Version 2)'. As per this excerpt from these guidelines, in the following notes there are references to 3 categories of trees :

"Table 2: Classes of Butternut, as defined in subsection 23.7(2) of O. reg. 242/08

Category 1 tree The butternut tree is affected by butternut canker to such an advanced degree that retaining the tree would not support the protection or recovery of butternut trees in the area in which the tree is located.

Category 2 tree The butternut tree is not affected by butternut canker or the butternut tree is affected by butternut canker but the degree to which it is affected is not too advanced and retaining the tree could support the protection or recovery of butternut trees in the area in which the tree is located.

Category 3 tree The butternut tree may be useful in determining sources of resistance to butternut canker."

**Area 1**

Most trees in Area 1 were located along trails and were generally easy to find and clearly marked. There were only two trees larger than 15 cm dbh. They were 43 and 29 cm; two trees growing together. Originally only the larger tree was numbered. They are now numbered 17A and 17B. Table 1a contains the ESA BHA Form 2 information for all trees. All trees were assessed as Category 1 or 2 on this site. This is because all trees except the two larger ones were less than 20 cm, and currently the ESA BHA system requires a tree to be over 20 cm dbh to be a Category 3 tree. However, based on the experience of the FGCA any size of tree should be considered for Category 3 status. Table 1b has the results of the Butternut Health Assessment. The two large trees appear to be Category 1 butternut.

Hybridity or purity of the butternut could not be determined for most trees. There appears to be a mix of pure and hybrid throughout the site. Male flowers were observed on trees 11 and 45 only. The catkins were short (less than 12 cm) and tree 11 had a dark pith. My assumption is they are butternut. I checked the pith on a few trees. Many were too small and I was not prepared to cut branches on every tree. Metal tags were put on all trees one cm and less. On some trees, tags are on the ground since there were no branches to hang it on. Eight trees were dead.

My general thoughts are that most of the trees along the trails are the result of nuts from the two large trees, scattered by squirrels, sprouted and grew by the open area along the path. There may be however other large trees on this site not yet discovered. This does not account for the observed probable hybrid trees on the site. I suggest in Table 1a there were at least 10 pure butternut and two hybrid butternut.

## Area 2

This area is in the valley of Reesor Creek, a branch of West Duffins Creek. Butternut are scattered along the floodplain, the side slopes and on the tablelands. Locating butternut here was problematic since much of the area is overgrown, there are no formal trails and most trees were identified in 2011 or earlier. However, most trees were greater than 25 cm so they were easier to locate in that regard. Many trees along the floodplain were established by nuts being carried down stream by flood waters. The floodplain had numerous spots of freshly laid alluvium.

I numbered trees with the tube paint given in the order of the data supplied starting from #1. I later realized that the older numbering was still visible on many of the trees. So, I repainted the older number where I saw it. On Table 2a, the numbers in red are the newly painted numbers.

Table 2a shows the Form 2 data. Of the 39 trees or locations identified, 11 were found dead, four could not be found living or dead and some were duplicated. Cankers were not counted on suspected hybrids or trees with less than 50 percent crown which is part of the ESA definition of Category 1 tree (not supportive of butternut recovery).

Only 15 trees were considered further to assign a Category. See Table 2b. Besides dead and not found etc., trees considered hybrid and those with very low crown percent were not considered. Five trees assessed were Category 3. All of these Category 3 trees should undergo DNA testing, or clear presence of nuts later in the season. Trees that were dead or considered hybrid were marked with red spray paint., except tree #7, the only tree west of Sideline 34.

## Area 3

Area 3 was at Bob Hunter Memorial Park. The fifteen data points provided, had multiple trees at each point and were scattered widely around the park. Thirteen points were from trees identified in 2002. Table 3a shows the results. Eight trees were assessed. The rest were found dead or not found at the provided UTM location. At some locations multiple trees were found but were mostly dead.

Seven trees were assessed further to assign a Category. See Table 3b. Tree #1, 5, and 8 (tube painted) were Category 3. Whether any of these trees are pure butternut will need to be determined by DNA analysis or clear presence of nuts later in the season.

## Area 4

This area is an old farm that appeared to be a commercial nut and fruit tree farm with open-grown trees in an orchard fashion. The operation of the farm has been long abandoned. There are black and English walnut. The purported butternut appears to be Japanese walnut- Heartnut (or maybe the hybrid buartnut). Most are scattered, open grown trees and all but two were in serious decline. Four of the trees had long (15+ cm) catkins including trees 1 and 2 which had 95 % live crown, which is a sign of hybridity. See Table 4a and 4b.

One purported butternut was newly found in a row of spruce and black walnut. It was assessed as Category 1 butternut.

## Conclusion

The four sites at RNUP had different situations and timing of initial identification of butternut. About 131 trees were reviewed. Seventy-nine trees had BHA assessment done. Eight trees were assessed as Category 3 in Areas 2 and 3. DNA analysis or further observation (fruiting) is required to determine hybridity or purity. Trees marked with red paint in Area 2 can be removed.

## Tables

Table 1a. Form 2. Priority Area 1 - Concession 7 and Webb Road, Uxbridge, Glasgow Pond

Table 1b BHA Analysis Area 1

Table 2a. Form 2. Priority Area 2 - Sideline 34 south of Concession Road 8, Pickering

Table 2b BHA Analysis Area 2

Table 3a. Form 2. Priority Area 3 - Bob Hunter Memorial Park, Markham

Table 3b BHA Analysis Area 3

Table 4a. Form 2. Priority Area 4 - 7937 Steeles Avenue East, Toronto

Table 4b BHA Analysis Area 4

## Codes

Crown class	Code
Dominant	D
Co-dominant	C
Intermediate	I
Suppressed	S

Origin	Code
Natural	N
Planted	P
Unknown	?

Dieback	Code
None	N
Twig	T
Branch	B

Bark Type	Code
Deep	D
Shallow	S

Seed Sign	Code
None	N
Male Flowers	MF
Female flowers	FF

Code	Tree Species	Code	Tree species
Aw	white ash		honeysuckle
App	apple	Mh	sugar maple
Bn	butternut	Mm	Manitoba maple
Bt	buckthorn	Mn	Norway maple
Ca	domestic cherry	Pc	Canada plum
Cc	choke cherry	Pr	red pine
Cw	white cedar	Ps	Scot's pine
Dal	alternate-leaved dogwood	Pw	white pine
Dro	red-osier dogwood	Sn	Norway spruce
Ew	white elm		sumac
	grape	Sw	white spruce
Haw	hawthorn	Wb	black walnut
He	hemlock		

## **Appendix to report FGCA June 2020 Bn survey for RNUP**

Table 1a. Form 2. Priority Area 1 - Concession 7 and Webb Road, Uxbridge, Glasgow Pond

Table 1b. BHA Analysis Area 1

Table 2a. Form 2. Priority Area 2 - Sideline 34 south of Concession Road 8, Pickering

Table 2b. BHA Analysis Area 2

Table 3a. Form 2. Priority Site 3 - Bob Hunter Memorial Park, Markham

Table 3b. BHA Analysis Area 3

Table 4a. Form 2. Priority Area 4 - 7937 Steeles Avenue East, Toronto

Table 4b. BHA Analysis Area 4

Table 1a. Form 2. Priority Area 1 - Concession 7 and Webb Road, Uxbridge, Glasgow Pond

butternut/hybrid		tree #	Crown class	Dieback	# stems	Stem length	Origin	Seed sign	Live Crown %	DBH (cm)	RF Open	RF Sooty	Sooty < 2m	Open <2 m	Sooty > 2m	Open >2 m	# Epic dead	# Epic live	Bark	# Callus	Distance	Competing Species	UTM E	UTM N	Comments/ Notes
		3	C	N	2	0.5	?	N	100	4,3	0	0	0	0	0	0	0	n.a.	2	>40	none	644410	4872390		
		4	C	N	1	0.5	?	N	100	9	0	0	0	2	0	3	0	0	n.a.	3	<40	Mh	644204	4872510	
B		5	C	T	1	0.5	?	N	90	2	0	0	0	0	0	0	0	n.a.	0	<40	none	644204	4872526	Bn like leaf scar; original tree chopped	
B		6	C	N	1	1.8	?	N	100	2	0	0	0	2	0	0	0	0	n.a.	0	<40	none	644204	4872526	Bnlike leaf scar; original tree chopped; 2 minor sprouts
		7	D	N	1	0.5	?	N	100	9	0	0	3	2	1	1	0	0	n.a.	2	<40	none	644202	4872525	
		8	D	N	1	1.7	?	N	100	2	0	0	0	0	0	0	0	0	n.a.	0	<40	none	644201	4872522	
		9	C	N	1	0.5	?	N	100	4	0	0	0	0	0	0	0	0	n.a.	0	<40	Dal	644206	4872531	
		10	DEAD																			644205	4872542		
B		11	D	T	3	1.5	?	MF	90	12,5,5	0	0	5	2	3	0	0	0	n.a.	5	<40	grape	644193	4872540	dark pith; smallish catkins
		12	D	T	1	1.5	?	N	95	11	0	0	4	0	0	0	0	0	n.a.	0	<40	Mm	644191	4872546	
		13	C	N	1	1.8	?	N	100	11	0	0	1	0	0	0	0	0	n.a.	0	<40	Mh, Ps	644194	4872550	
		14	C	N	1	1.5	?	N	100	8	0	0	0	0	0	0	0	0	n.a.	0	<40	Plum, Aw	644189	4872553	
		15	I	N	1	0.4	?	N	100	6	0	0	0	0	0	0	0	0	n.a.	0	<40	App, Mn	644178	4872572	
		16	DEAD																			644178	4872565		
		17A	C	B	1	6.0	N	N	50	43	2	2	3	2	0	0	0	0	S	2	<40	Mh, Pr	644126	4872560	only 2 large trees on this site
		17B	C	B	1	6.0	N	N	50	29	1	3	4	1	4	0	10+	10+	S	1	<40	Mh, Pr	644126	4872560	only 2 large trees on this site
		18	DEAD																			644111	4872536		
		19	I	B	1	2.5	?	N	75	6	0	0	3	1	0	2	0	0	n.a.	2	<40	Pr	644109	4872534	bad shape
		20	S	N	1	1.6	?	N	100	8	0	0	0	0	0	0	0	0	n.a.		<40	Mn, Ps	644110	4872532	UTM is actually 644118
		20A	S	N	1	0.3	N	N	100	1	0	0	2	0	0	0					<40	Mn, Bn	644118	4772520	TAG; newly found; 0.5 m west of 20; tree is 0.8m high
H		21	S	N	1	1.0	?	N	100	9	0	2	1	0	0	0	0	0	n.a.		<40	Ps	644103	4872538	Hyb. pith and leaf scar

Table 1a Continued

butternut/hybrid		tree #	Crown class	Dieback	# stems	Stem length	Origin	Seed sign	Live Crown %	DBH (cm)	RF Open	RF Sooty	Sooty < 2m	Open < 2 m	Sooty > 2m	Open > 2 m	# Epic dead	# Epic live	Bark	# Callus	Distance	Competing Species	UTM E	UTM N	Comments/ Notes
		22	S	N	1	1.0	?	N	100	4	0	0	0	0	0	0	0	n.a.		<40	Mh, Bt, Ps	644054	4872522	2 wounds at 1.5m, not sooty	
		23	S	N	1	1.8	?	N	100	3	0	0	0	0	0	0	0	n.a.		<40	Ps, Mn	644076	4872525		
		24	S	N	1	1.5	?	N	60	1	0	0	0	0	1	2	0	0	n.a.	2	<40	Ps, Ew	644082	4872536	2 scrape wounds at 0.3m
		25	DEAD																			644084	4872574		
		26	S	B	1	1.5	?	N	90	3	0	0	1	2	0	0	0	0	n.a.	2	<40	Bt, Dal	644076	4872572	
		27	S	N	1	1.0	?	N	100	2	0	0	0	0	0	0	0	0	n.a.	1	<40	Ps	644095	4872514	
		28	S	N	1	1.7	?	N	100	2	0	0	0	0	0	0	0	0	n.a.	2	<40	Ps, honeysuck	644096	4872509	highly supressed; dried sooty connected to wound
		29	DEAD							1												644100	4872507		
B		32	S	N	1	0.3	?	N	100	4	0	0	1	2	0	0	0	0	n.a.	1	<40	Ps, Mh	644104	4872497	Bn; recovery from mech. wound at 0.3m
		34	S	T	1	0.5	?	N	70	2	0	0	1	0	0	0	2	0	n.a.	0	<40	Bt, Ps, Mn	644113	4872489	
		35	S	N	1	0.5	?	N	100	1	0	0	1	0	0	0	0	0	n.a.	0	<40	Bt, Ps, Mn	644117	4872487	TAG
		36	DEAD							5												644121	4872497		
		37	DEAD							2												644121	4872504		
		38	I	N	1	0.5	?	N	100	3	0	0	0	0	0	0	0	0	n.a.	0	<40	Ps, Mh	644084	4872459	
		39	S	N	1	0.5	?	N	100	--	0	0	0	0	0	0	0	0	n.a.	0	<40	Sw	644071	4872467	TAG; Total height 1.2m; has scrapes
		40	I	N	1	0.5	?	N	100	1	0	0	0	0	0	0	0	0	n.a.	0	<40	Ps, Sw	644086	4872447	TAG; Total height 1.6m
		41	THIS IS AN ANOMALOUS TREE, on ground with vertical sprouts																				644094	4872429	
H		42	I	N	1	0.5	?	N	100	9	0	0	3	0	0	0	0	0	n.a.	1	<40	Cw	644129	4872429	large mechanical scar; hybrid pith
		43	S	N	1	0.5	?	N	100	<1	0	0	0	0	0	0	0	0	n.a.	0	<40	Pw	644125	4872459	highly suppressed
		44	S	N	1	2.0	?	N	25	1	0	0	0	0	0	0	0	0	n.a.		<40	Bt, Pr	644066	4872552	highly suppressed; almost dead
H		45	S	T	1	2.0	?	MF	100	11	0	3	2	3	3	2	4	1	n.a.	2	<40	Mn, Ps	644051	4872542	some hybridity exhibited
		46	S	B	1	2.0	?	N	50	3	0	0	0	0	0	0	0	0	n.a.	0	<40	Ps, Mn	644180	4872566	
		47	DEAD																			644196	4872542		
		48	C	N	1	0.5	?	N	100	1	0	0	0	0	0	0	0	0	n.a.	2	<40	Dro	644206	4872543	TAG; 2 wounds with callus but no canker

Table 1a. Continued

butternut/hybrid		tree #	Crown class	Dieback	# stems	Stem length	Origin	Seed sign	Live Crown %	DBH (cm)	RF Open	RF Sooty	Sooty < 2m	Open <2 m	Sooty > 2m	Open >2 m	# Epic dead	# Epic live	Bark	# Callus	Distance	Competing Species	UTM E	UTM N	Comments/ Notes	
		49	S	N	1	0.5	?	N	100	1	0	0	0	0	0	0	0	n.a.	0	<40	Sn		644207	4872541	TAG	
B		50	I	B	1	1.0	?	N	70	3	0	1	3	0	0	0	0	n.a.	1	>40	sumac		644219	4872581	mech. Wound	
B		51	S	N	1	0.4	?	N	100	3	0	1	0	0	0	0	0	n.a.	0	>40	sumac, apple		644217	4872583	Dark pith	
B		52	C	N	1	1.8	?	N	100	5	0	1	0	0	0	0	0	n.a.	0	>40	Cw, Dro		644231	4872597	Dark pith	
B		53	I	N	1	1.5	?	N	100	3	0	0	0	0	0	0	0	n.a.	0	>40	Ps, Ca		644261	4872622	Dark pith	
B		54	S	N	1	1.5	?	N	100	4	0	0	1	0	0	0	0	n.a.	2	>40	Haw, Pc		644311	4872569	Dark pith; 2 branch wounds, no canker	
		55	I	N	1	2.0	?	N	100	10	0	0	0	1	0	3	0	0	n.a.	2	<40	Pr, Mm		644508	4872629	
		56	I	N	1	1.5	?	N	100	13	0	0	2	2	0	0	0	0	n.a.	0	<40	Dal, Cw		644512	4872626	
B		57	C	T	1	1.5	?	N	95	11	0	0	5	2	0	0	0	0	n.a.	2	<40	Mn, App		644518	4872630	dark pith and Bn leaf scar
		58	S	N	1	1.5	?	N	100	1	0	0	0	0	0	0	0	0	n.a.	0	>40	Haw, Cw, Dal		644328	4872579	TAG; UTM is actually 644335 4872577; 2 m east of trail
		59	S	T	1	3.0	?	N	80	5	0	0	0	4	0	0	0	0	n.a.	3	>40	Pr, Dal, Mh		644094	4872686	
		60	S	N	1	3.0	?	N	100	3	0	0	0	1	0	0	0	0	n.a.	1	<40	Pr, Dal		644071	4872613	

Table 1b. BHA Analysis Area 1.

BHA Tree Analysis (version: December 2013)																									
This table is to be completed by a designated Butternut Health Assessor (BHA).																									
BHA Report #		Assessment Date(s)	May 28, June 4, 11, 2020												Total # Butternut Trees in BHA Report	62									
BHA ID #	22	BHA Name	Terry Schwan																						
Landowner / Client Name		Rouge National Urban Park -																							
Property Location		Concession 2 and Webb Road, Uxbridge - Glasgow Pond, Priority Area #1																							
input field data										automatic calculations from field data						Categories:									
Tree #	Live Crown %	Tree dbh (cm)	# bole cankers				# root flare (RF) cankers		# root flare (RF) cankers	# root flare (RF) cankers	Circ. (cm) = Pi x dbh	total bole canker width (sooty x 2.5 + open x 5)	total RF canker width (sooty x 2.5 + open x 5)	bole canker % of circ.	RF canker % of circ.	total bole & root canker % of 2xCirc	LC% >= 50 & BC% = 0	LC% >70 & BRC % <20	LC% >70 & BC % <20	Preliminary tree call	FINAL TREE CALL a Cat 2, dbh>20cm <40m from a Cat 1				
			sooty (S) (will be assigned 2.5 cm per canker)	open (O) (will be assigned 5 cm per canker)	RF	RF	Circ (cm)	BC (cm)														RC (cm)	BC%	RC%	BRC%
			S <2 m	S >2 m	O <2 m	O >2 m	RF S	RF O														Circ (cm)	BC (cm)	RC (cm)	BC%
3	100	4	0	0	0	0	0	0	n	12.56	0.0	0.0	0.0	0.0	0.0	2	2	2	2	#REF!					
4	100	9	0	0	2	3	0	0	y	28.26	25.0	0.0	88.5	0.0	44.2	1	1	1	1	#REF!					
5	90	2	0	0	0	0	0	0	y	6.28	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
6	100	2	0	0	2	0	0	0	y	6.28	10.0	0.0	159.2	0.0	79.6	1	1	1	1	1					
7	100	9	3	1	2	1	0	0	y	28.26	25.0	0.0	88.5	0.0	44.2	1	1	1	1	1					
8	100	2	0	0	0	0	0	0	y	6.28	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
9	100	4	0	0	0	0	0	0	y	12.56	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
10	10	1	0	0	0	0	0	0		3.14	0.0	0.0	0.0	0.0	0.0	1	1	1	1	1					
11	90	12	5	3	2	0	0	0	y	37.68	30.0	0.0	79.6	0.0	39.8	1	1	1	1	1					
12	95	11	4	0	0	0	0	0	y	34.54	10.0	0.0	29.0	0.0	14.5	1	2	1	2	2					
13	100	11	1	0	0	0	0	0	y	34.54	2.5	0.0	7.2	0.0	3.6	1	2	2	2	2					
14	100	8	0	0	0	0	0	0	y	25.12	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
15	100	6	0	0	0	0	0	0	y	18.84	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
16	0									0	0.0	0.0	#####	#####	#####	####	###	###	##	#DIV/0!					
17A	<50	43	3	0	2	0	2	2	y	135	17.5	15.0	13.0	11.1	12.0	1	2	2	2	3					
17B	<50	29	4	4	1	0	3	1	y	91.06	25.0	12.5	27.5	13.7	20.6	1	1	1	1	1					
18	0									0	0.0	0.0	#####	#####	#####	####	###	###	##	#DIV/0!					
19	75	6	3	0	1	2	0	0	y	18.84	22.5	0.0	119.4	0.0	59.7	1	1	1	1	1					
20	100	8	0	0	0	0	0	0	y	25.12	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
20A	100	1	2							3.14	5.0	0.0	159.2	0.0	79.6	1	1	1	1	1					
21	100	9	1	0	0	0	2	0	y	28.26	2.5	5.0	8.8	17.7	13.3	1	2	2	2	2					
22	100	4	0	0	0	0	0	0	y	12.56	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
23	10	3	0	0	0	0	0	0	y	9.42	0.0	0.0	0.0	0.0	0.0	1	1	1	1	1					
24	60	1	0	1	0	2	0	0	y	3.14	12.5	0.0	398.1	0.0	199.0	1	1	1	1	1					
25	0									0	0.0	0.0	#####	#####	#####	####	###	###	##	#DIV/0!					
26	90	3	1	0	2	0	0	0	y	9.42	12.5	0.0	132.7	0.0	66.3	1	1	1	1	1					
27	100	2	0	0	0	0	0	0	y	6.28	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
28	100	2	0	0	0	0	0	0	y	6.28	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2					
29	0	1								3.14	0.0	0.0	0.0	0.0	0.0	1	1	1	1	1					
32	100	4	1	0	2	0	0	0	y	12.56	12.5	0.0	99.5	0.0	49.8	1	1	1	1	1					
34	70	2	1	0	0	0	0	0	y	6.28	2.5	0.0	39.8	0.0	19.9	1	1	1	1	1					

Table 1b. Continued

35	100	1	1	0	0	0	0	0	y	3.14	2.5	0.0	79.6	0.0	39.8	1	1	1	1	1
36	0	5								15.7	0.0	0.0	0.0	0.0	0.0	1	1	1	1	1
37	0	2								6.28	0.0	0.0	0.0	0.0	0.0	1	1	1	1	1
38	100	3	0	0	0	0	0	0	y	9.42	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
39	100	--	0	0	0	0	0	0	y	#####	0.0	0.0	#####	#####	#####	####	###	###	##	#####
40	100	1	0	0	0	0	0	0	y	3.14	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
42	100	9	3	0	0	0	0	0	y	28.26	7.5	0.0	26.5	0.0	13.3	1	2	1	2	2
43	100	1	0	0	0	0	0	0	y	3.14	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
44	25	1	0	0	0	0	0	0	y	3.14	0.0	0.0	0.0	0.0	0.0	1	1	1	1	1
45	100	11	2	3	3	2	3	0	y	34.54	37.5	7.5	108.6	21.7	65.1	1	1	1	1	1
46	50	3	0	0	0	0	0	0	y	9.42	0.0	0.0	0.0	0.0	0.0	2	1	1	2	2
47	0									0	0.0	0.0	#####	#####	#####	####	###	###	##	#DIV/0!
48	100	1	0	0	0	0	0	0	y	3.14	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
49	100	1	0	0	0	0	0	0	y	3.14	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
50	70	3	3	0	0	0	1	0	y	9.42	7.5	2.5	79.6	26.5	53.1	1	1	1	1	1
51	100	3	0	0	0	0	1	0	n	9.42	0.0	2.5	0.0	26.5	13.3	2	2	2	2	2
52	100	5	0	0	0	0	1	0	n	15.7	0.0	2.5	0.0	15.9	8.0	2	2	2	2	2
53	100	3	0	0	0	0	0	0	n	9.42	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
54	100	4	1	0	0	0	0	0	n	12.56	2.5	0.0	19.9	0.0	10.0	1	2	2	2	2
55	100	10	0	0	1	3	0	0	y	31.4	20.0	0.0	63.7	0.0	31.8	1	1	1	1	1
56	100	13	2	0	2	0	0	0	y	40.82	15.0	0.0	36.7	0.0	18.4	1	2	1	2	2
57	95	11	5	0	2	0	0	0	y	34.54	22.5	0.0	65.1	0.0	32.6	1	1	1	1	1
58	100	1	0	0	0	0	0	0	n	3.14	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
59	80	5	0	0	4	0	0	0	n	15.7	20.0	0.0	127.4	0.0	63.7	1	1	1	1	1
60	100	3	0	0	1	0	0	0	y	9.42	5.0	0.0	53.1	0.0	26.5	1	1	1	1	1

Table 2a. Form 2. Priority Area 2 - Sideline 34 south of Concession Road 8, Pickering

[illegible]

Table 2a. Continued

	Original #	tree #	Crown class	Dieback	# stems	Stem length	Origin	Seed sign	Live Crown %	DBH (cm)	RF Open	RF Sooty	Sooty < 2m	Open < 2 m	Sooty > 2m	Open > 2 m	# Epic dead	# Epic live	Bark	# Callus	Distance	Competing Species	UTM E	UTM N	Notes/Comments
B	184a	20	C	B	1	5	N	FF	90	31	4	0	2	3	0	0	0	0	S	4		Wb	644770	4866603	6 - 8 flowers on long rachis; MF less than 12 cm
B	184b	20	C	T	1	4	N	FF	95	27	4	1	0	2	2	1	0	0	S	4		Wb	644770	4866603	
B	207	21	D	B	1	6	N	FF	70	32	5	2	0	6	1	1	0	4	S	7	open grown		644765	4866535	3 flower clusters of 6 nutlets
	206	22	C	B	1	7	N	N	60	28	5	1	1	5	0	5	2	0	S	6			644742	4866547	
	208	23	DEAD OR MISSING																				644729	4866523	
	209	24	DEAD OR MISSING																				644710	4866505	
	187	25	DEAD OR MISSING																				644716	4866505	
	186	26	DEAD OR MISSING																				644726	4866523	
	216	27	C	B	1	2	N	N	10	40													644704	4866456	there is another small deadtree beside #216 - ~15 cm
	215	28	C	T	1	5	N	FF	90	38	4	1	0	0	0	0	0	0	S	0	>40	Cw	644695	4866421	
	214	29	C	B	1	4	N	N	50	35	2	1	1	2	0	0	0	0	S	1	<40	Cw	644672	4866411	
	213	30	DEAD						0	10													644665	4866400	
	212	31	DEAD						0	24													644650	4866386	
	211	32	DEAD																				644645	4866401	
	210	33	C	B	1	6	N	N	70	43	8	1	7	3	4	2	4	1	S	7	>40	Cw	644647	4866405	
	188	34	D	B	1	5	N	N	60	69	8	0	5	2	2	2	0	0	D	5			644871	4866342	
	815816	35	COULD NOT FIND																				644871	4866383	
B	183	36	C	T	1	7	N	N	95	28	3	2	4	6	4	4	0	0	S	10+		Cw, Mh	645044	4866325	along lane; many scars
B	182	37	C	T	1	5	N	FF	95	27	1	4	3	2	0	0	0	0	S	4		Mn	645075	4866254	along creekside

Table 2b. BHA Analysis Area 2.

BHA Tree Analysis (version: December 2013)																				
This table is to be completed by a designated Butternut Health Assessor (BHA).																				
BHA Report #		Assessment Date(s)	June 3, 8, 11, 2020												Total # Butternut Trees in BHA Report		15			
BHA ID #	22	BHA Name	Terry Schwan																	
Landowner / Client Name		Rouge National Urban Park																		
Property Location		Priority Site #2 - Sideline 34 south of Concession Road 8, Pickering																		
input field data										automatic calculations from field data						Categories:				
Tree #	Live Crown %	Tree dbh (cm)	# bole cankers				# root flare (RF) cankers		<40 m from cankered tree? (Y or N)	Circ. (cm) = $\pi \times \text{dbh}$	total bole canker width (sooty x 2.5 + open x 5)	total RF canker width (sooty x 2.5 + open x 5)	bole canker % of circ.	RF canker % of circ.	total bole & root canker % of 2xCirc	1: non-retainable, 2: retainable, 3: archivable				FINAL TREE CALL a Cat 2, dbh>20cm <40m from a Cat 1
			sooty (S) (will be assigned 2.5 cm per canker)		open (O) (will be assigned 5 cm per canker)		RF S	RF O								LC% ≥ 50 & BC% = 0	LC% >70 & BRC % <20	LC% >70 & BC % <20	Preliminary tree call	
			S <2 m	S >2 m	O <2 m	O >2 m														
2	90	50	1	0	2	0	2	4	y	157	12.5	25.0	8.0	15.9	11.9	1	2	2	2	3
8	90	45	3	0	1	1	3	5	y	141.3	17.5	32.5	12.4	23.0	17.7	1	2	2	2	3
17	60	46	1	1	5	1	1	3	y	144.4	35.0	17.5	24.2	12.1	18.2	1	1	1	1	1
17b	80	41	1	0	1	0	2	3	y	128.7	7.5	20.0	5.8	15.5	10.7	1	2	2	2	3
19	95	15	1	0	0	0	1	3	y	47.1	2.5	17.5	5.3	37.2	21.2	1	1	2	2	2
184a	90	31	2	0	3	0	0	4	y	97.34	20.0	20.0	20.5	20.5	20.5	1	1	1	1	1
184b	95	27	0	2	2	1	1	4	y	84.78	20.0	22.5	23.6	26.5	25.1	1	1	1	1	1
207	70	32	0	1	6	1	2	5	y	100.5	37.5	30.0	37.3	29.9	33.6	1	1	1	1	1
206	60	28	1	0	5	5	1	5	y	87.92	52.5	27.5	59.7	31.3	45.5	1	1	1	1	1
215	90	38	0	0	0	0	1	4	y	119.3	0.0	22.5	0.0	18.9	9.4	2	2	2	2	3
29	50	35	1	0	2	0	1	2	y	109.9	12.5	12.5	11.4	11.4	11.4	1	1	1	1	1
210	70	43	7	4	3	2	1	8	y	135	52.5	42.5	38.9	31.5	35.2	1	1	1	1	1
188	60	69	5	2	2	2	0	8	?	216.7	37.5	40.0	17.3	18.5	17.9	1	1	1	1	1
183	95	28	4	4	6	4	2	3	y	87.92	70.0	20.0	79.6	22.7	51.2	1	1	1	1	1
182	95	27	3	0	2	0	4	1	y	84.78	17.5	15.0	20.6	17.7	19.2	1	2	1	2	3

Table 3a. Form 2. Priority Site 3 - Bob Hunter Memorial Park, Markham

Original ID #	Pin #	Paint Tree #	Crown class	Dieback	# stems	Stem length	Origin	Seed sign	Live Crown %	DBH (cm)	RF Open	RF Sooty	Sooty < 2m	Open < 2m	Sooty > 2m	Open > 2m	# Epic dead	# Epic live	Bark	# Callus	Distance	Competing Species	UTM E	UTM N	Notes/Comments
877309	1	8	C	T	1	6	?	FF	95	34	1	4	0	0	0	0	0	0	D		<40	Mm, grape	643228	4857689	maybe FF; 1 cluster of 6 nutlets
	near 1	No #	C		1				40	46	0	0	0	0	0	0							643211	4857707	also tree with broken top nearby
896574	2		NOT FOUND AT THIS UTM																				643065	4857388	
878259	3		NOT FOUND AT THIS UTM																				643213	4857188	
877489	4		NOT FOUND STANDING																				643315	4856991	
892476	5		DEAD						0	59/30													643813	4857105	2 dead stems
	no #	6	NOT FOUND AT THIS UTM; ONLY Wb																				643932	4857782	
878260	7	7	DEAD						0	32													644258	4857807	dead standing
871710	8		DEAD																				644607	4857728	3 dead , 2 still standing; orange flag. tape
	no #	9	NOT FOUND																				645287	4858212	
806309	10		NOT FOUND																				644188	4857458	walnut and black locust
878256	11	2	C	B	1	8	N	N	75	54	8	0	4	2	4	2	0	0	D	9	>40	Pw, He, Mh	644195	4857170	
	11	3	C	T	1	10	N	N	95	19	0	0	0	0	0	0	0	0	S	1	>40	Mh, Cw	644180	4857242	
	11		WALNUT AND BLACK LOCUST																				644241	4857184	
892478	12	1	C	B	1	9	N	N	80	51	3	4	2	0	1	0	0	0	D	4	>40	Mh, Cw	644300	4857119	UTM Changed
878257	13		DEAD						0	43													644462	4856961	orange flagging tape
	14		ONLY WALNUT SEEN																				644292	4856881	
	near 14	4	C	B	1	11	N	N	50	46	2	1	0	2	2	2	0	0	D	3	>40	Mh, Cw, Wb	644204	4856930	
896579	near 14	5	C	B	1	10	N	N	80	28	0	2	0	0	0	0	0	0	S	0	>40	Wb	644243	4856985	beside car wreck
868179	15		ONLY WALNUT SEEN																				644574	4856725	
	new	6	D	B	1	1.5	?	N	70	39	5	0	4	3	5	0	0	0	D	2	>40		644345	4856977	open grown

Table 3b.BHA Analysis Area 3.

BHA Tree Analysis (version: December 2013)																				
This table is to be completed by a designated Butternut Health Assessor (BHA).																				
BHA Report #		Assessment Date(s)	June 1, 11, 2020												Total # Butternut Trees in BHA Report			7		
BHA ID #	22	BHA Name	Terry Schwan																	
Landowner / Client Name		Rouge National Urban Park -																		
Property Location		Bob Hunter Memorial Park, 7277 14th Ave. Markham																		
input field data										automatic calculations from field data						Categories:				
Tree #	Live Crown %	Tree dbh (cm)	# bole cankers				# root flare (RF) cankers		<40 m from cankered tree? (Y or N)	Circ. (cm) = Pi x dbh	total bole canker width (sooty x 2.5 + open x 5)	total RF canker width (sooty x 2.5 + open x 5)	bole canker % of circ.	RF canker % of circ.	total bole & root canker % of 2xCirc	1: non-retainable, 2: retainable, 3: archivable				FINAL TREE CALL a Cat 2, dbh>20cm <40m from a Cat 1
			sooty (S) (will be assigned 2.5 cm per canker)		open (O) (will be assigned 5 cm per canker)		RF S	RF O								LC% >= 50 & BC% = 0	LC% >70 & BRC % <20	LC% >70 & BC % <20	Preliminary tree call	
			S <2 m	S >2 m	O <2 m	O >2 m														
1	80	51	2	1	0	0	4	3	y	160.1	7.5	25.0	4.7	15.6	10.1	1	2	2	2	3
2	75	54	4	4	2	2	0	8	y	169.6	40.0	40.0	23.6	23.6	23.6	1	1	1	1	1
3	95	19	0	0	0	0	0	0	y	59.66	0.0	0.0	0.0	0.0	0.0	2	2	2	2	2
4	50	46	0	2	2	2	1	2	y	144.4	25.0	12.5	17.3	8.7	13.0	1	1	1	1	1
5	80	28	0	0	0	0	2	0	y	87.92	0.0	5.0	0.0	5.7	2.8	2	2	2	2	3
6	60	39	4	5	3	0	0	5	n	122.5	37.5	25.0	30.6	20.4	25.5	1	1	1	1	1
7										0	0.0	0.0	####	####	####	####	###	###	##	#DIV/0!
8	95	34	0	0	0	0	4	1	y	106.8	0.0	15.0	0.0	14.1	7.0	2	2	2	2	3

Table 4a. Form 2. Priority Area 4 - 7937 Steeles Avenue East, Toronto

[illegible]

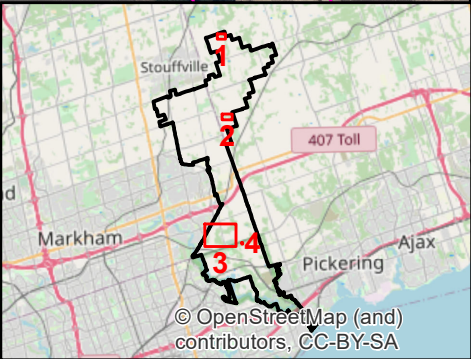
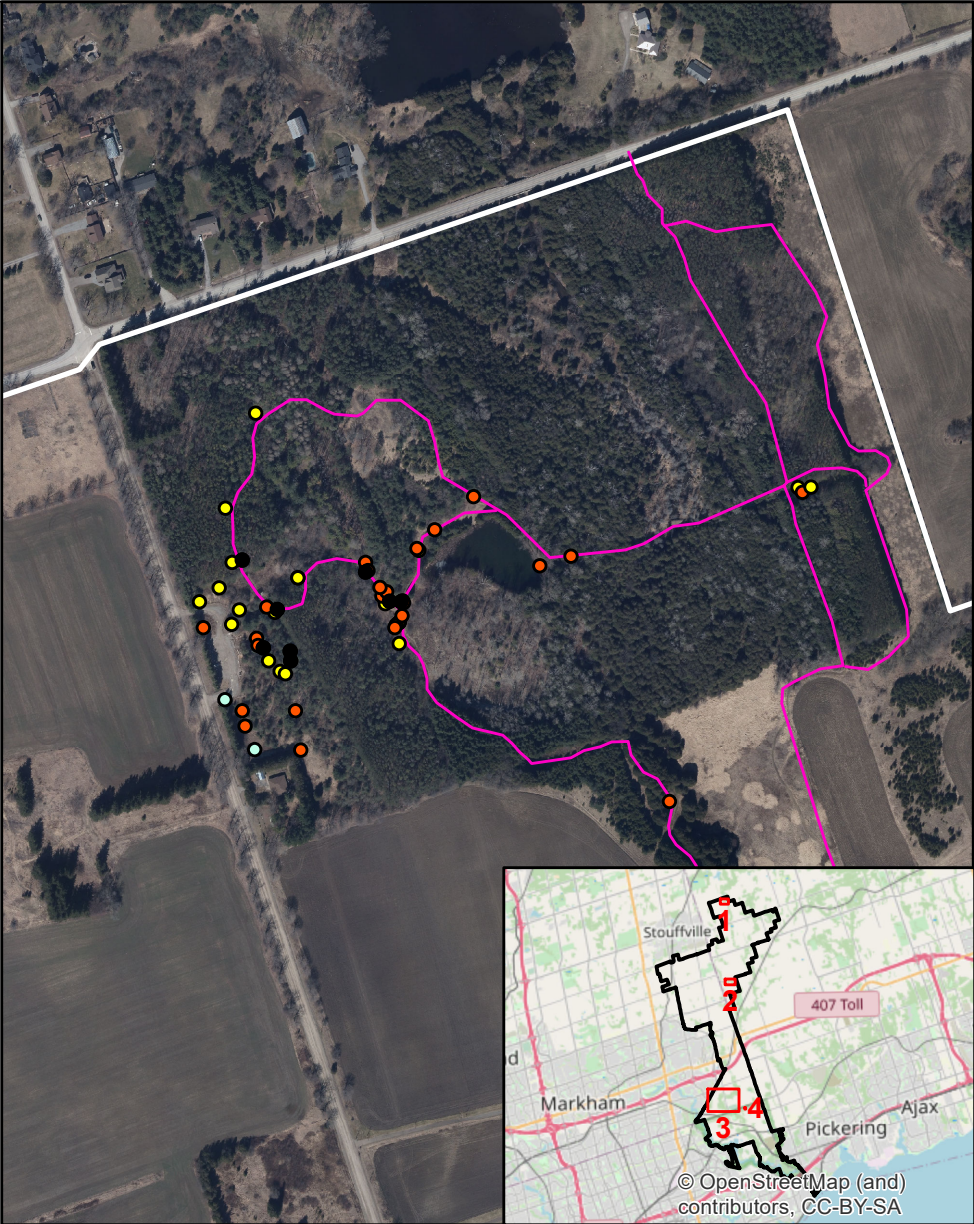
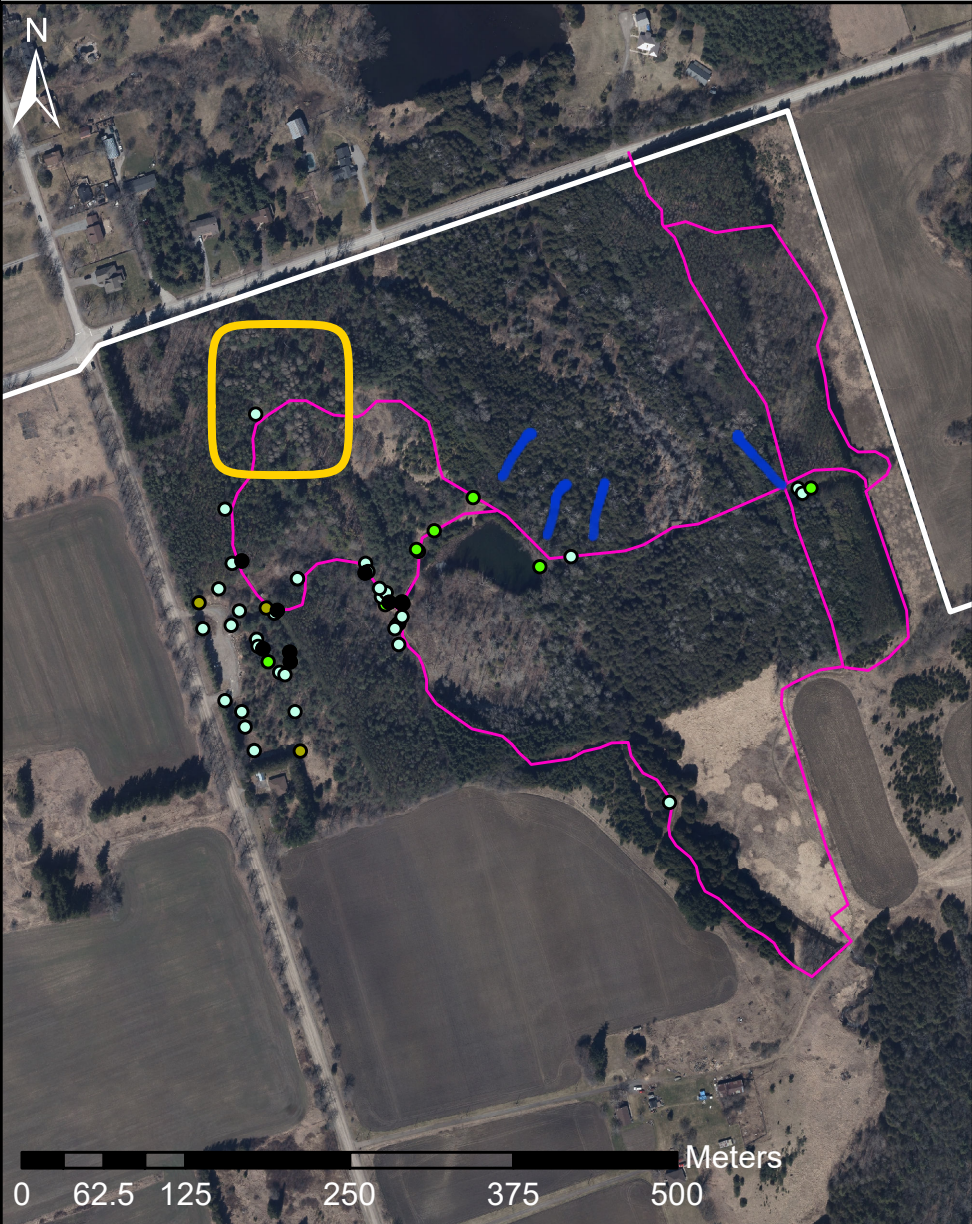
Table 4b. BHA Analysis Area 4

BHA Tree Analysis (version: December 2013)																				
This table is to be completed by a designated Butternut Health Assessor (BHA).																				
BHA Report #		Assessment Date(s)	04-Jun-20						Total # Butternut Trees in BHA Report				1							
BHA ID #	22	BHA Name	Terry Schwan																	
Landowner / Client Name			Rouge National Urban Park																	
Property Location		7937 Steeles Ave. East, Toronto; Priority Site 4																		
input field data										automatic calculations from field data						Categories:				
Tree #	Live Crown %	Tree dbh (cm)	# bole cankers				# root flare (RF) cankers		<40 m from cankered tree? (Y or N)	Circ. (cm) = Pi x dbh	total bole canker width (sooty x 2.5 + open x 5)	total RF canker width (sooty x 2.5 + open x 5)	bole canker % of circ.	RF canker % of circ.	total bole & root canker % of 2xCirc	LC% >= 50 & BC% = 0	LC% >70 & BRC % <20	LC% >70 & BC % <20	Preliminary tree call	FINAL TREE CALL a Cat 2, dbh>20cm <40m from a Cat 1
			sooty (S) (will be assigned 2.5 cm per canker)		open (O) (will be assigned 5 cm per canker)		RF S	RF O												
			S <2 m	S >2 m	O <2 m	O >2 m														
11	90	33	6	1	3	1	3	5	n	103.6	37.5	32.5	36.2	31.4	33.8	1	1	1	1	1
2										0	0.0	0.0	#####	#####	#####	####	###	###	##	#DIV/0!
3										0	0.0	0.0	#####	#####	#####	####	###	###	##	#DIV/0!

# Area #1

Butternut vs Hybrid Species

Final Class Call 1 - 3



## Legend

- Misclassification (Black Walnut)
- Dead or Missing Trees
- Unknown
- Butternut
- Hybrid
- Unknown
- Class 1
- Class 2
- Class 3

Created by: Sustainable Land Use Management  
Date: 2020-07-20



**Solicitation No. 5P201-20-0104**

**North East Trail: Rouge National Urban Park  
Parks Canada**

## **APPENDIX D**

# **Clean Equipment Protocol for Industry**

# Clean Equipment Protocol for Industry

Inspecting and cleaning equipment for the  
purposes of invasive species prevention



*Catalyst for research and response*



#### Publication Information

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For more information on invasive plants in Ontario, visit [www.ontario.ca/invasivespecies](http://www.ontario.ca/invasivespecies), [www.ontarioinvasiveplants.ca](http://www.ontarioinvasiveplants.ca), [www.invadingspecies.com](http://www.invadingspecies.com), or [www.invasivespeciescentre.ca](http://www.invasivespeciescentre.ca).

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# Introduction

## Why Invasive Plants are a Problem

Invasive alien species are “a growing environmental and economic threat to Ontario. Alien species are plants, animals and microorganisms that have been accidentally or deliberately introduced into areas beyond their normal range. Invasive species are defined as harmful alien species whose introduction or spread threatens the environment, the economy, or society, including human health (Government of Canada 2004).” (Ontario Invasive Species Strategic Plan, 2012). The great majority of plant invasions occur in habitats that have been disturbed either naturally or by humans (Rejmanek 1989; Hobbs and Huenneke 1992; Hobbs 2000).

The ecological effects of invasive species are often irreversible and, once established, they are extremely difficult and costly to control or eradicate. According to Pimental et al. (1999), invasive species in the U.S. cause economic and environmental damages totalling over \$138 billion per year, with agricultural weed control and crop losses totalling approximately \$34 billion per year. Exact figures for the total economic and environmental damages are not available for Canada. In Ontario however, the costs of dealing with just one invasive species is astonishing; Zebra Mussels cost Ontario power producers who draw water from the lake \$6.4 million per year in increased control/operating costs and about \$1 million per year in research costs (Colautti et al. 2006).

Invasive species can spread to new areas when contaminated mud, gravel, water, soil and plant material are unknowingly moved by equipment used on different sites. This method of spread is called an unintentional introduction, and is one of the four major pathways for invasive species introduction into a new area of Ontario (Ontario Invasive Species Strategic Plan, 2012).



**Buckthorn removal, Lynde Shores Conservation Area.**

Photo by: Central Lake Ontario Conservation Authority

Invasive plant seed and other propagules (plant material, i.e. rhizomes) have the ability to travel sight unseen in mud attached to or lodged in various parts and spaces between parts of vehicles, machinery and other mechanical equipment. A recent study at Montana State University found that most seeds (99% on paved roads and 96% on unpaved roads) stayed attached to the vehicle after traveling 160 miles (257 km) under dry conditions.

Invasive plant species are commonly transported on or in vehicles and construction equipment when they are moved to new locations. Those vehicles include four-wheel drives, excavators, tractors, loaders, water trucks and all-terrain vehicles. Failure to properly clean vehicles and machinery of soils, mud, and contaminated water that may contain invasive species seed and propagules can result in permanent, irreversible environmental impacts. These impacts can mean substantial cost to the landowner, land manager and/or the user. Businesses may also face liability issues for activities and operations that result in the introduction of invasive species.

Some of the invasive species in Ontario which have been known to spread through equipment transfer include:

- **Common Buckthorn** (*Rhamnus cathartica*)
- **Dog-strangling Vine** (*Cynanchum rossicum*)
- **Garlic Mustard** (*Alliaria petiolata*)
- **Giant Hogweed** (*Heracleum mantegazzianum*)
- **Glossy Buckthorn** (*Frangula alnus*)
- **Japanese Knotweed** (*Polygonum cuspidatum*)
- **Miscanthus or Chinese Silver Grass** (*Miscanthus sinensis*)
- **Invasive Phragmites or Common Reed** (*Phragmites australis subsp. australis*)
- **Reed Canary Grass** (*Phalaris arundinacea*)
- **Wild Parsnip** (*Pastinaca sativa*)
- **Wild Chervil** (*Anthriscus sylvestri*)



**Dog-strangling Vine**  
(*Cynanchum rossicum*)  
Photo by: Hayley Anderson



**Garlic Mustard**  
(*Alliaria petiolata*)  
Photo by: Ken Towle



**Invasive Phragmites**  
(*Phragmites australis subsp. australis*)  
Photo by: Michael Irvine

These plants impact biodiversity by out-competing native species for space, sunlight, and nutrients. They can also have impacts on road and driver safety by physically blocking intersection sightlines, and in the case of invasive *Phragmites* and *Miscanthus*, may fuel intense grass fires if ignited, which can damage utility stations and hydro lines.

### The harmful effects of invasive species include:

- Physical and structural damage to infrastructure
- Human health hazards (i.e. giant hogweed and wild parsnip exposure)
- Delays and increased cost in construction activities
- Environmental damage (i.e. erosion)
- Aesthetic degradation
- Loss of biodiversity
- Reduced property values
- Loss of productivity in woodlots and agriculture

# Why Cleaning Vehicles and Equipment is Important

Passenger and recreational vehicles as well as heavy machinery are major vectors for spreading terrestrial invasive species into new areas.

Preventing the spread of invasive species has proven to be considerably more cost effective than controlling established populations. The spread of invasive species through unintentional introduction can be minimized significantly by the diligent cleaning of vehicles and equipment when leaving one site and moving to the next. In the case of large properties, cleaning before moving to a new site is recommended, even if it is within the same property.

This guide has been developed for the construction, agriculture, forestry, and other land management industries, to provide equipment operators and practitioners with tools and techniques to identify and prevent the unintentional introduction of invasive species. It establishes a standard for cleaning vehicles and equipment and provides a guide where current codes of practice, industry standards or other environmental management plans are not already in place.

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## Passenger and recreational vehicles include:

- 2WD and 4WD cars
- 2WD and 4WD trucks
- All Terrain Vehicles (ATV's)
- Motorbikes
- Snowmobiles

## Heavy machinery includes:

- Trucks
  - Tractors
  - Mowers
  - Slashers
  - Trailers
  - Backhoes
  - Graders
  - Dozers
  - Excavators
  - Skidders
  - Loaders
  - Water Tankers and Trucks
- 



**Dog-strangling Vine plants attached to ATV.**

Photo by: Francine Macdonald



**Plant material attached to bobcat.**

Photo by: TH9 Outdoor Services

# Impacts of Invasive Species on Industry

## Construction

In the UK, Japanese Knotweed (*Polygonum cuspidatum* or *Fallopia japonica*) is classified as a hazardous material. When construction occurs in established Japanese Knotweed stands workers sift the soil to remove root fragments and institute treatment plans to ensure that the Knotweed does not re-sprout, as it can damage housing foundations by growing through concrete and asphalt. The contractors must also thoroughly clean their equipment, and dispose of the contaminated soil at biohazard waste sites. While we do not have these requirements in Ontario, Japanese Knotweed is present here.

Invasive plant species can also increase site preparation and weed control costs, and reduce property values. For example, in Vermont the presence of the aquatic invasive plant Eurasian Watermilfoil (*Myriophyllum spicatum*) depressed shoreline residence property value by as much as 16.4% (Zhang and Boyle, 2010).

## Forestry/Agriculture

Invasive plant species which become established in forests will out-compete native species and prevent forest re-generation after logging or natural disturbance. Dog-strangling Vine (*Cynanchum rossicum*) is of particular concern in conifer plantations. This species thrives in the filtered light and open soils of mature plantations, and suppresses seedling establishment of native hardwoods. If its invasion continues, very few juvenile trees will survive to fill the shrinking canopy of over-mature pines. Reforestation sites are also susceptible; the thick mats of vegetation and aggressive competition from Dog-strangling Vine decrease available planting space and increase costs as more mature vegetation needs to be planted in order to ensure the new vegetation can outcompete the invasive plant. As a result, expensive control programs are often required.

## Land Management (Trail Use/Maintenance)

Recreational trail use and the maintenance of trails can facilitate the transport of invasive plant material and seeds, and create open and disturbed sites that are prime locations for the establishment of invasive species. Studies have proven that trails act as corridors which assist in the spread of invasive plant species. Humans, their pets, and vehicles such as ATV's can be vectors of invasion along trails because seeds and plant pieces can be carried on equipment and clothing. In addition, frequent trampling along trails alters soil properties, limits the growth of some native species, and creates conditions that may favour the growth of non-native species (Kuss et al. 1985; Marion et al. 1985; Yorks et al. 1997).

## Roadsides/Utilities

Invasive species can increase the cost of roadside and utility maintenance by requiring additional maintenance and control efforts. The presence of invasive species can also provide a safety hazard. In the case of Phragmites and Miscanthus (invasive grass species), along with interrupting sight lines, the dead stalks which remain standing each autumn also provide combustible material. Fires in these stands burn intensely, and can damage utilities and hydro lines. Phragmites along roadsides is generally assumed to be spread through the transport and burial of rhizome fragments through ditching, ploughing, and other human activities that transport rhizomes on machinery. Studies have shown that vehicles and road-fill operations can transport invasive plant seeds into uninfested areas, and road construction and maintenance operations provide optimal disturbed sites for seed germination and seedling establishment (Schmidt 1989; Lonsdale & Lane 1994; Greenberg et al. 1997; Trombulak & Frissell 2000).

# Steps to Prevent the Unintentional Introduction of Invasive Species from Equipment

Inspection and cleaning of all machinery and equipment should be performed in accordance with the procedures, checklists and diagrams provided in this protocol.

When visiting more than one site, always schedule work in the sites that are the least disturbed and free of known invasive species first, and visit sites with known invasive species infestations last. This will greatly reduce the risk of transferring plants to new locations.

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## When to Inspect

### Inspection should be done before:

- Moving vehicles out of a local area of operation
- Moving machinery between properties or sites within the same property where invasive species may be present in one area, and not in another
- Using machinery along roadsides, in ditches, and along watercourses
- Vehicles using unformed dirt roads, trails or off road conditions
- Using machinery to transport soil and quarry materials
- Visiting remote areas where access by vehicles is limited

### Inspection should be done after:

- Operating in areas known to have terrestrial invasive plants or are in high risk areas (i.e. recently disturbed areas near known invaded areas)
- Transporting material (i.e. soil) that is known to contain, or has the potential to contain, invasive species
- Operating in an area or transporting material that you are uncertain contain invasive species
- In the event of rain. If mud contains seeds, they can travel indefinitely until it rains or the road surface is wet, allowing for long distance transport. This may result in transporting seeds to areas where those species did not previously exist

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## How to Inspect

- Inspect the vehicle thoroughly inside and out for where dirt, plant material and seeds may be lodged or adhering to interior and exterior surfaces.
- Remove any guards, covers or plates that are easy to remove.
- Attention should be paid to the underside of the vehicle, radiators, spare tires, foot wells and bumper bars.

If clods of dirt, seed or other plant material are found, removal should take place immediately, using the techniques outlined below.

## When to Clean

Vehicles and heavy equipment that stay on formed and sealed roads have a low risk of spreading invasive species. Cleaning is only required when inspection identifies visible dirt clods and plant material or when moving from one area to another.

Depending on the invasive species present, vehicles may need to be cleaned even when deep snow is present. Invasive *Phragmites*, for example, can still be spread, even in packed snow because the seed heads are usually above the surface of the snow. Other plants, such as dog-strangling vine, will be contained beneath deep snow.

*\*Regular inspection of vehicles and machinery will identify if any soil or plant material has been collected on or in vehicles and machinery.*

## Where to Clean

Clean the vehicle/equipment in an area where contamination and seed spread is not possible (or limited). The site should be:

- Ideally, mud free, gravel covered or a hard surface. If this option is not available, choose a well maintained (i.e. regularly mowed) grassy area.
- Gently sloping to assist in draining water and material away from the vehicle or equipment. Care should be taken to ensure that localized erosion will not be created, and that water runs back into the area where contamination occurred.
- At least 30m away from any watercourse, water body and natural vegetation.
- Large enough to allow for adequate movement of larger vehicles and equipment.

*\*Safely locate the vehicle and equipment away from any hazards. If mechanized, ensure engine is off and the vehicle or equipment is immobilized.*

## How to Clean Inside

Clean the interior of the vehicle by sweeping, vacuuming or using a compressed air device. Particular attention should be paid to the floor, foot wells, pedals, seats, and under the seats.

## How to Clean Outside

Knock off all large clods of dirt. Use a pry bar or other device if necessary.

Identify areas that may require cleaning with compressed air rather than water such as radiators and grills. Clean these areas first prior to using water.

Clean the vehicle with a high pressure hose in combination with a stiff brush and/or pry bar to further assist the removal of dirt clods.

Start cleaning from the top of the vehicle and work down to the bottom.

Emphasis should be placed on the undersides, wheels, wheel arches, guards, chassis, engine bays, radiator, grills, and other attachments.

When the cleaning is finished avoid driving through the waste water when removing the vehicle or equipment from the cleaning site.

For equipment such as water trucks that may be exposed to aquatic invasive species, trucks should be disinfected with bleach solution before conducting work in a new area. For further information please refer to the Invading Species Awareness Program's Technical Guidelines listed under Contacts and Resources.



**Hosing down a vehicle in Queensland, Australia**

Photo by: TH9 Outdoor Services

# Final Inspection Checklist

**Conduct a final inspection to ensure the following general clean standard has been achieved:**

- No clods of dirt should be visible after wash down.
- Radiators, grills, and the interiors of vehicles should be free of accumulations of seed, soil, mud and plant material parts including seeds, roots, flowers, fruit, and or stems.

Diagrams have been provided to assist in quickly identifying key areas to inspect and clean on a variety of vehicles associated with the targeted industries. These can be used in combination with vehicle checklists to ensure all areas of the vehicles have been inspected and cleaned.

## Equipment Required

- A pump and high pressure hose OR high pressure water unit
- Minimum water pressure for vehicle cleaning should be at least 90 pounds per square inch. Water can be supplied as high volume/low pressure or low volume/high pressure (NOAA Fisheries Service).
- Air compressor and blower OR vacuum
- Shovel
- Pry bar
- Stiff brush or broom



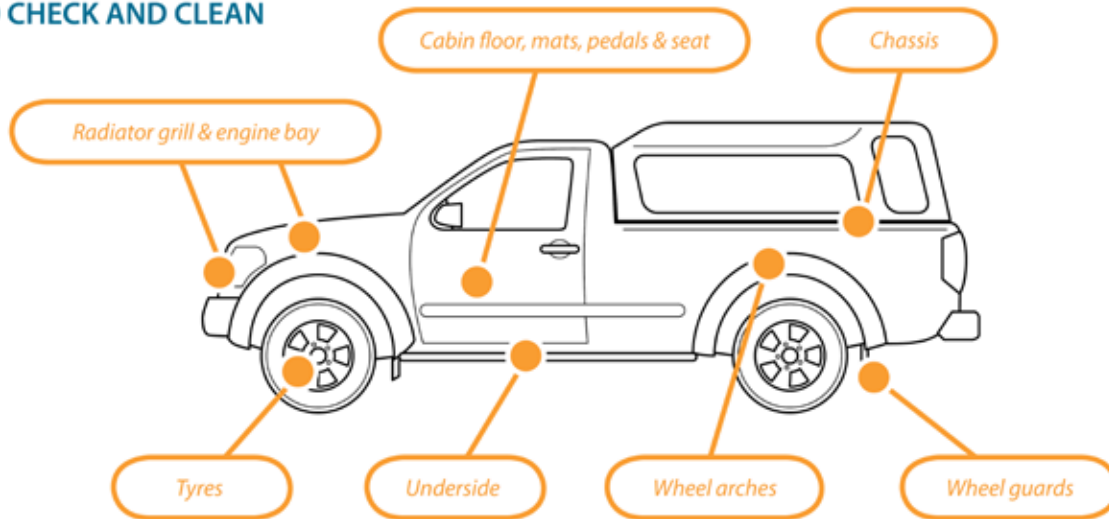
**Cleaning station at construction site.**

Photo by: Mark Heaton, OMNR

# Inspection and Cleaning Diagrams and Checklists

## 2WD and 4WD Vehicles

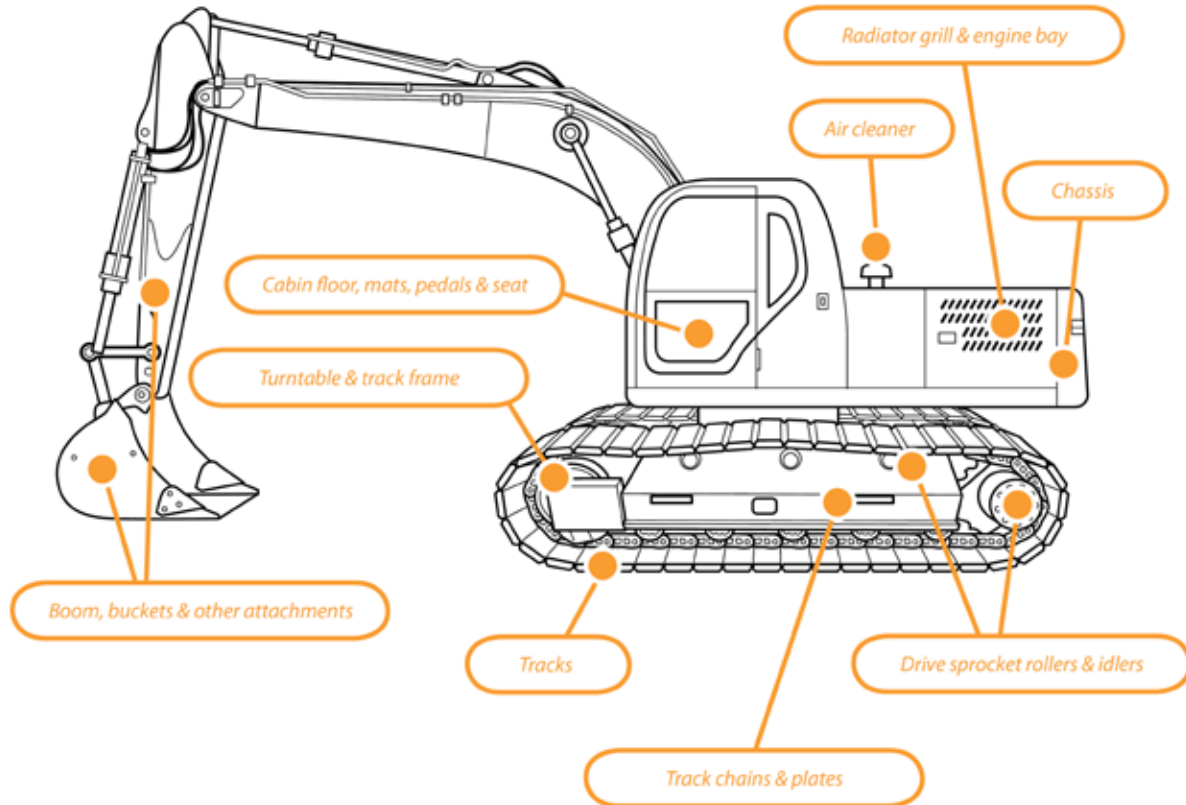
### 4WD VEHICLE WITH KEY SPOTS TO CHECK AND CLEAN



		✓
<b>Cabin</b>	Floor, mats, pedals, seats	
<b>Engine</b>	Radiators, engine bay, grill	
<b>Body</b>	Underside, chassis, crevices, ledges, bumper bars	
<b>Wheels</b>	All wheels (including spare), wheel arches, guards	
<b>Tray</b>	Floor, canopy (if included)	

# Excavator

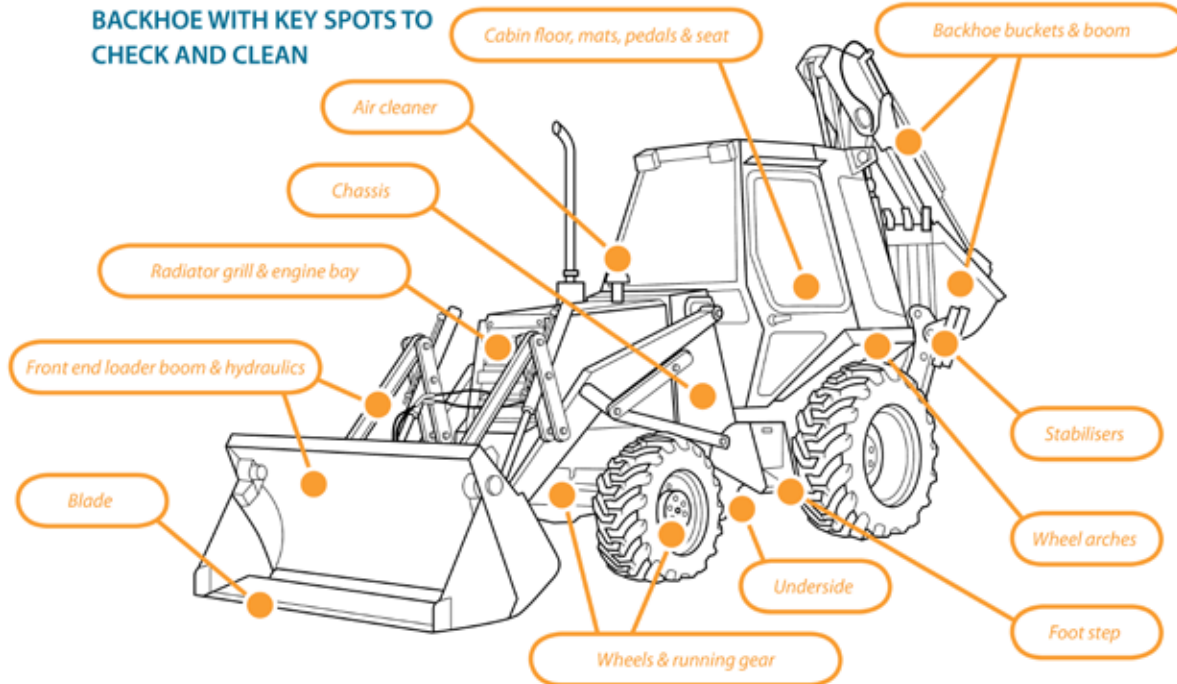
## EXCAVATOR WITH KEY SPOTS TO CHECK AND CLEAN



		✓
Cabin	Floor, mats, pedals, seats	
Engine	Radiators, engine bay, grill, air cleaner	
Tracks	Tracks, track frame, drive sprocket rollers, idlers	
Body Plates	Plates of cabin	
Body	Ledges, channels	
Bucket		
Booms		
Turret Pivot		

## Backhoe

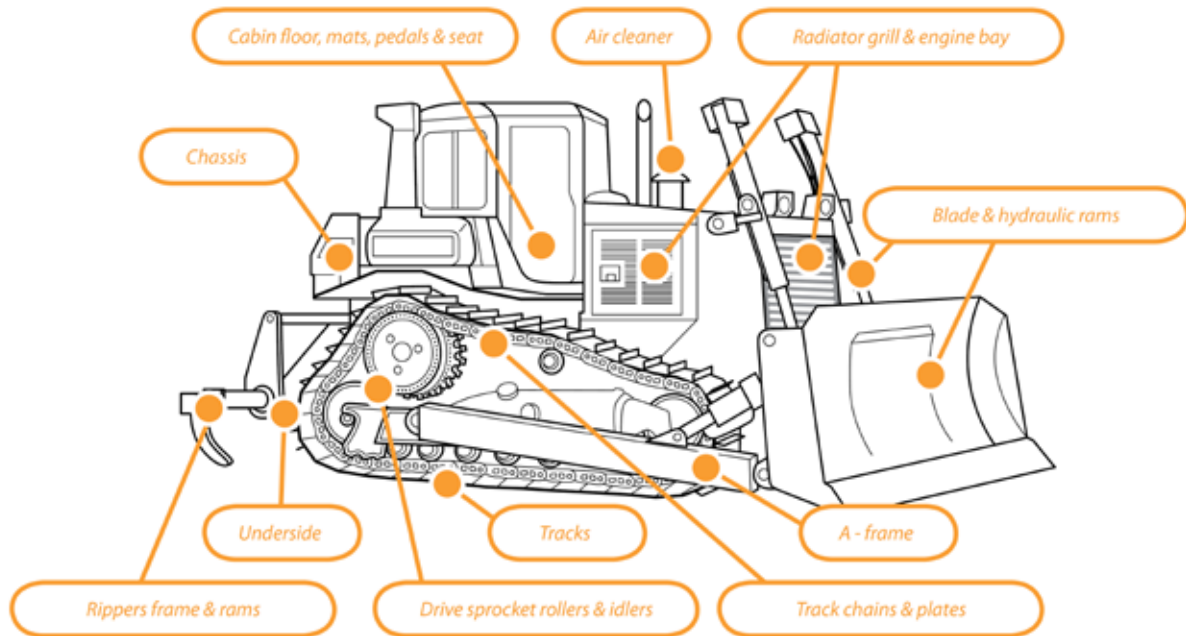
### BACKHOE WITH KEY SPOTS TO CHECK AND CLEAN



		✓
Cabin	Floor, mats, pedals, seats, foot step	
Engine	Radiators, engine bay, grill, air cleaner	
Wheels	All wheels (including spare), wheel arches, guards	
Front end loader	Blade, hydraulics, booms	
Backhoe	Buckets, boom, hydraulics, stabilisers	

## Bulldozer

### BULLDOZER WITH KEY SPOTS TO CHECK AND CLEAN



		✓
Cabin	Floor, mats, pedals, seats	
Engine	Radiators, engine bay, grill, air cleaner	
Tracks	Tracks, track frame, drive sprocket rollers, idlers	
Body Plates	Belly plates, rear plates	
Body	Ledges, channels	
Blade	Pivot points, hydraulic rams, a-frame	
Ripper	Ripper frame, ripper points	

# Contacts and Resources

Ontario Invasive Species Strategic Plan 2012. Government of Ontario. Online, accessed May 8, 2012.

[http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@biodiversity/documents/document/stdprod\\_097634.pdf](http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@biodiversity/documents/document/stdprod_097634.pdf)

Invasive Species Management for Infrastructure Managers and the Construction Industry 2008. Wade, M. Booy, O. and White, V. Online, accessed April 27, 2012.

[http://www.ciria.org/service/Web\\_Site/AM/ContentManagerNet/ContentDisplay.aspx?Section=Web\\_Site&ContentID=9001](http://www.ciria.org/service/Web_Site/AM/ContentManagerNet/ContentDisplay.aspx?Section=Web_Site&ContentID=9001)

T.I.P.S (Targeted Invasive Plant Solutions) Highway Operations. British Columbia Invasive Species Council. Online, accessed May 8, 2012.

[http://www.bcinvativeplants.com/iscbc/publications/TIPS/Highways\\_Operations\\_TIPS.pdf](http://www.bcinvativeplants.com/iscbc/publications/TIPS/Highways_Operations_TIPS.pdf)

Invading Species Awareness Program Workshop Manual: Aquatic Invasive Species: An Introduction to Identification, Collection and Reporting of Aquatic Invasive Species in Ontario Waters (includes information on decontaminating equipment).

<http://www.invadingspecies.com/download/publications/manuals/WorkshopManual.pdf>

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## Reporting Invasive Species

To report invasive species, or view maps of existing records, visit the Invading Species Awareness Program website [www.invadingspecies.com/report/](http://www.invadingspecies.com/report/) or [www.eddmaps.org/Ontario](http://www.eddmaps.org/Ontario).

Or call the OFAH/MNR Invading Species Awareness Program Hotline at **1-800-563-7711**.

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## Acknowledgements

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### Clean Equipment Protocol Working Group:

Diana Shermet, Central Lake Ontario Conservation Authority; Paula Berketo, Ontario Ministry of Transportation; Travis Cameron, Ontario Ministry of Natural Resources; Jennifer Hoare, Ontario Parks; Michael Irvine, Ontario Ministry of Natural Resources; Alison Kirkpatrick, OFAH/MNR Invading Species Awareness Program; Erika Weisz, Ontario Ministry of Natural Resources; Amanda Chad, Ontario Power Generation; Nancy Vidler, Lambton Shores Phragmites Community Group; Nigel Buffone, Du Pont Canada Company; Ewa Bednarczuk, Lower Trent Conservation Authority

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### More Information:

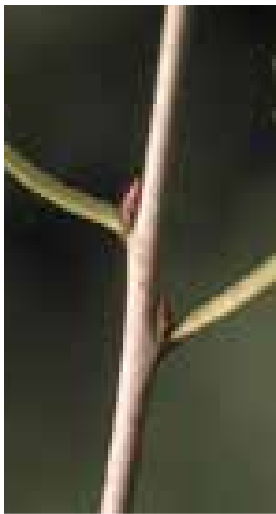
Ontario Invasive Plant Council: [www.ontarioinvasiveplants.ca](http://www.ontarioinvasiveplants.ca)

# Appendix A: Identification of Invasive Plants Found in Ontario

- **Common Buckthorn** (*Rhamnus cathartica*) and **Glossy Buckthorn** (*Frangula alnus*)
- **Dog-strangling Vine** (*Cynanchum rossicum*)
- **Garlic Mustard** (*Alliaria petiolata*)
- **Japanese Knotweed** (*Polygonum cuspidatum*)
- **Phragmites or Common Reed** (*Phragmites australis subsp. australis*)
- **Giant Hogweed** (*Heracleum mantegazzianum*)

## common & glossy buckthorn

(*Rhamnus cathartica* & *R. frangula*)



**Plant type:** Shrub/small tree

**Arrangement:** Common buckthorn are sub-opposite (almost opposite). Glossy buckthorn are alternate.

**Leaf:** The common buckthorn leaf is egg shaped, edge of the leaf is “pebbled” (small rounded teeth). Veins converging toward leaf top. The glossy buckthorn leaf is more slender (tear drop shaped) and smooth margined.

**Bark:** Smooth, young bark with prominent raised patches or lenticels; rough texture and peeling bark when mature.

**Seed/Flowers:** Flowers are green-yellowish, small and inconspicuous. Green berries becoming purplish/black in late summer, berry > 1 cm in diameter.

**Buds/Twigs:** Common buckthorn has thorn-like tip on many twigs. Glossy buckthorn buds have no bud scales and lack thorny tips to twigs.

**Habitat:** Various - forest, thickets, meadows, dry to moist soils.

**Similar native species:** Native dogwoods, which lack the thorny “tip”. Native dogwoods are truly opposite in arrangement of twigs; only alternate leaved (pagoda) dogwood has alternate branching.

## dog-strangling vine

(*Cynanchum rossicum* & *C. nigrum*)



**Plant type:** Herb, twining vine

**Arrangement:** Opposite

**Leaf:** Lance shaped, smooth margin (edge)

**Bark:** n/a

**Seed/Flowers:** Bean shaped seed pod with seeds attached to downy 'umbrellas'. Flowers - pink (*C. rossicum*) or purple (*C. nigrum*) with five petals.

**Buds/Twigs:** n/a

**Habitat:** Dry to moist soils; more dominant in meadows and woodland edges.

**Similar native species:** Swamp milkweed (*Asclepias incarnata* spp.), is an upright plant, typically found in wetland habitats.

## garlic mustard

(*Alliaria petiolata*)



**Plant type:** Herb

**Arrangement:** Alternate

**Leaf:** Saw tooth like edge, elongated heart shape. Garlic/onion smell when crushed. Leaves are kidney shaped with prominent veins.

**Bark:** n/a

**Seed/Flowers:** Cluster of small white flowers with four petals. Small black < 1 mm rounded seed found in elongated 'tube-like' seed pods (similar to a bean pod).

**Buds/Twigs:** n/a

**Habitat:** Various – dry to moist soils, in all habitat types, less often in meadows.

**Similar native species:** n/a

## japanese knotweed

(*Polygonum cuspidatum*)



**Plant type:** Herb, 2 - 4 m in height.

**Arrangement:** Alternate

**Leaf:** Tear drop shaped, sharp pointed, dark green, flattened at base.

**Bark:** n/a

**Seed/Flowers:** Flowering stalk of many small greenish-white flowers.

**Buds/Twigs:** Large plant with a 'bamboo-like' stem. Stem light green maturing to tan colour.

**Habitat:** Moist to wet soils found in wetlands, water-courses and roadside ditches.

**Similar native species:** None.

## common reed

(*Phragmites australis*)



**Plant type:** Grass

**Arrangement:** Alternate

**Leaf:** Broad leaf > 1 cm wide.

**Bark:** n/a

**Seed/Flowers:** Dense cascading 'broom-like' flower head. 'Cottony' in appearance when mature.

**Buds/Twigs:** Stems rough and ridged, ligule a densely hairy band. Mature plants > 3 m tall.

**Habitat:** Moist to wet soils. Found in wetlands, water-courses and road side ditches.

**Similar native species:** Species of mannagrass (*Glyceria* sp) including tall northern, eastern and rattlesnake grass. A native common reed exists but has a smooth stem and the ligule is not hairy. It is also quite rare.

# giant hogweed

(*Heracleum mantegazzianum*)



**Plant type:** Herb. Mature plants can be over 3m tall.

**Arrangement:** Alternate

**Leaf:** Lobed leaf 1-2 m wide, lobes sharp-pointed.

**Bark:** n/a

**Seed/Flowers:** Small, white flowers in a large umbrella-shaped cluster, .75 m wide.

**Buds/Twigs:** Hairy stem with purple spots.

**Habitat:** Fresh to wet soils in forests, swamps, meadows, marshes.

**Similar native species:** Cow parsnip (*Heracleum maximum*) – has smaller flowers, no purple spots on stems. Angelica (*Angelica atropurpurea*) has a rounded-topped flower cluster and leaves divided into many leaflets.

**Do not touch this plant because it is poisonous. If you do, wash your skin immediately in cool soapy water and do not expose the area to sunlight.**

**Seek professional advice before removing.**

## Identification of Invasive Plants found in Ontario Photos by:

Credit Valley Conservation, Greg Bales, Ken Towle, Patrick Hodge,  
Ontario Federation of Anglers and Hunters, Francine Macdonald, Matt Smith

