SPECIFICATIONS

FOR

FORT WELLINGTON N.H.S.C.
EASTERN PALISADE REHABILITATION

PRESCOTT, ONTARIO
PARKS CANADA

ISSUED FOR TENDER

Project No.: 1175 2021-06-18

Fort Wellington N.H.S.C.
Eastern Palisade
Rehabilitation

Parks Canada
Prescott, Ontario

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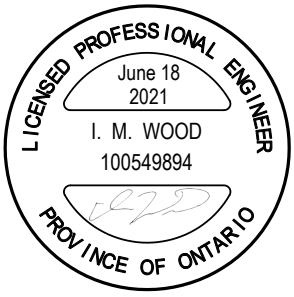

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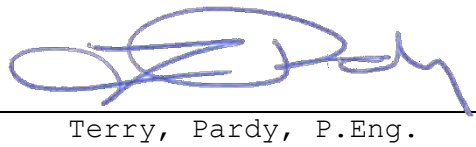

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Appendices

Appendix A – Location Plan and No-Go Zones
Appendix B – Geotechnical Report

List of Drawings

Civil

C01 – EXISTING SITE PLAN
C02 – SITE PLAN

Structural

S01 – GENERAL NOTES AND SECTIONS
S02 – PALISADE ELEVATIONS
S03 – PALISADE DETAILS AND SECTIONS
S04 – PALISADE LAYOUT, SECTIONS AND DETAILS

END OF SECTION

PART 1 - GENERAL

1.1 PRECEDENCE

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Specification.

1.2 DESCRIPTION OF WORK

.1 The work under this Contract covers the furnishing of all labour, materials and equipment required for rehabilitation of fortification elements at the Fort Wellington National Historic Site located in Prescott, Ontario. The project includes but is not limited to the following:

.1 Survey of existing top of palisade posts are anchor post locations to ensure elevations of new posts will match existing. Survey to be provided to Departmental Representative for review prior to beginning any work.

.2 Pre-construction topographic survey of existing conditions will be provided by Departmental Representative at award.

.3 Delineation of No-Go Zones as directed by PCA Archaeologist. Refer to Appendix A for identified No-Go Zones and machinery corridors.

.4 Removal of existing timber fortification palisades on North-East side of fort as per drawings. Existing posts that are removed will become property of the contractor for reuse or disposal.

.5 Protection of existing fortification structures, utilities, building elements, surface features, heritage landscape, asphalt and concrete pavements, and archaeological sensitive areas from damage while Work is in progress.

.6 Supply of all materials and connections and construction of new cedar palisades.

.7 Supply and installation of new helical pile foundations for palisades.

.8 Surface treatment of disturbed areas during construction, including topsoil (stockpile and imported), seeding and sodding.

.9 Removal of waste materials and debris; clean and reinstate areas affected by Work.

1.3 CODES

.1 Meet or exceed requirements of: Contract documents, Specified standards, codes and referenced documents.

.2 Conform to the latest revision of any referenced standard as re-affirmed or revised to the date of specification. Standards or codes not dated shall be deemed editions in force on the date of tender advertisement.

1.4 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy of each of the following:

.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 Environmental Protection Plan;
.11 Health and safety plan and other safety related documents.
.12 Other documents specified;
.13 Manufacturer's installation and application instructions; and
.14 All testing results.

1.5 WORK SCHEDULE

.1 Provide within 5 working days after Contract Award, construction schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents and as specified herein.

.2 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of the Departmental Representative.

.3 All work at the Fort Wellington National Historic Site shall be completed as follows:

1.5 WORK SCHEDULE (Cont'd)

.3 (Cont'd)

.1 All work unless noted otherwise shall take place during park off-season. Off-Season shall be between after Thanksgiving long Weekend to before Victoria Day long Weekend. Substantial completion of work shall be no later than Friday before Victoria Day long weekend.

.2 Examination work may be permitted between after Labour Day weekend and Thanksgiving weekend, upon approval from Departmental Representative.

.3 Approved other activities may occur during Park season, but must be completed in accordance with operations (firing the cannon, rifle demonstrations, etc.) but will not require seasonal work.

.4 Schedule to indicate all calendar dates from commencement to completion of all work within the time stated in the accepted bid.

.5 Provide sufficient details in schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.

.6 Work schedule must take into consideration and reflect the work phasing.

.7 Completed schedule shall be approved by Departmental Representative. When approved, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.

.8 Isolated small crew work and investigations that do not impact site operations may occur at any time of year and must be coordinated and scheduled with Parks Canada.

.9 Ensure that all subtrades and subcontractors are made aware of the work restraints and operational restrictions specified.

.10 Schedule Updates:

.1 Submit when requested by Departmental Representative.

1.5 WORK SCHEDULE (Cont'd)

.3 (Cont'd)

.10 (Cont'd)

.2 Provide information and pertinent details explaining reasons for necessary changes to implementation plan.

.3 Identify problem areas, anticipated delays, impact on schedule and proposed corrective measures to be taken.

.11 Departmental Representative will make interim reviews and evaluate progress of work based on approved schedule. Frequency of such reviews will be as decided by Departmental Representative. Address and take corrective measures on items identified by reviews and as directed by Departmental Representative. Update schedule accordingly.

.12 In every instance, change or deviation from the Work Schedule, no matter how minimal the risk or impact on safety or inconvenience to users or public might appear, will be subject to prior review and approval by the Departmental Representative.

1.6 CONTRACTOR'S USE OF SITE

.1 Contractor's use of site for trailers storage and preparatory work shall be limited to an area facilitated and approved by Departmental Representative. Any additional areas required shall be approved by the Departmental Representative prior to use.

.2 Maintain the site in a tidy condition free from the accumulation of waste products and debris. Upon substantial performance of the work, remove surplus products, tools, machinery and equipment from the site. Completion of clean-up is required for total performance of the work.

.3 Provide any and all traffic control services required for the project.

.4 Main vehicular access routes and staging areas to be restricted to present-day roadways, parking lots and pathways. All other vehicular access routes must be approved by Departmental Representative in contractor site plan submission.

1.6 CONTRACTOR'S USE OF SITE (Cont'd)

.5 Obtain all necessary permits to perform work and to comply with all permit requirements and conditions.

.6 Maintain work during construction. Undertake continuous maintenance each day. Maintain roadway and structures in a safe and tidy condition.

1.7 PROJECT MEETINGS

.1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

.2 The Departmental Representative shall make available, with adequate notice, meeting facilities for regular project meetings.

.3 Attend project meetings as specified. Arrange for and ensure applicable project sub-trades attend meetings as required.

1.8 SETTING OUT OF WORK

.1 Employ a certified surveyor to mark out work, including layout and elevations of new palisades. All surface modifications are restricted to the identified construction limits.

.2 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.3 Provide devices needed to lay out and construct work.

.4 Supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.

.5 Provide coordinates, elevations and dimensions from site as required by the Departmental Representative.

1.9 EXISTING SERVICES

.1 Where Work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction.

1.9 EXISTING SERVICES (Cont'd)

.2 Work that involves temporary disruption of services will be scheduled through the Departmental Representative. Give Departmental Representative minimum 72 hours notice of any disruption of services.

.3 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.4 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.6 Record locations of maintained re-routed and abandoned service lines.

.7 Confirm all inverts and critical elevations in the field prior to construction.

1.10 ADDITIONAL DRAWINGS

.1 Departmental Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in the Contract Documents.

1.11 CONSTRUCTION SAFETY MEASURES

.1 The Contractor must submit a Safety Plan prior to the pre-construction meeting.

.2 The Contractor must sign and submit a Parks Canada Occupational Health and Safety (OHS) Attestation Form.

1.12 EXCAVATION

.1 Prior to commencing any excavation, notify Departmental Representative and authorities, and check for and become aware of all buried utilities and submit findings for review and approval by Departmental Representative.

1.12 EXCAVATION (Cont'd)

.2 Contractor to make every effort to minimize extents of excavation within area of work. Restrict excavations to limits indicated on drawings. Notify Departmental Representative of any areas where additional excavations are required.

.3 No excavation is permitted during the installation and removal of the ground protection measures of the No-Go Zones and vehicle and machinery corridors. Refer to Map in Appendix A for No-Go Zones and machinery corridors.

.4 In the event that significant features (structural remains and/or high artifact concentrations) are encountered during construction activities, excavation shall cease in the immediate area and Parks Canada Department Representatives to be informed immediately.

1.13 STANDARD HOURS

.1 The Contractor must maintain existing site hours for the work unless otherwise authorized by Departmental Representative.

1.14 SITE CONDITIONS

.1 Promptly notify Departmental Representative if subsurface conditions differ materially from those indicated in Contract Documents or a reasonable assumption of probable conditions based thereon.

.2 Contractor shall visit Fort Wellington National Historic Site and review existing site conditions prior to starting the work. Site visits and timeline to be confirmed by Parks Canada.

.3 A geotechnical investigation has been completed. For subsurface information refer to Appendix B for Geotechnical Report.

1.15 WORK WITHIN HISTORIC SITE BOUNDARIES

.1 The Work is within a National Historic Site. It is essential that all lands remain as undisturbed as possible. Use standards and methods beyond those for normal construction in order to protect the environment and ensure aesthetics of the Work. Strictly adhere to contract limits and take every precaution to minimize environmental damage and disruption to vegetation and structures or existing services, both on construction and storage sites.

.1 If damage occurs during construction, bear the expense to immediately restore such damaged areas to the satisfaction of the Departmental Representative.

.2 If restoration fails to satisfy specified requirements, the Departmental Representative may complete repairs at the Contractor's expense.

.3 Ensure no damage will be done to aerial or underground electrical /communications cables.

.4 Follow Provincial requirements regarding: pit and Quarry guidelines; and Environmental Construction Practice Specifications.

.5 Make arrangements with authorities or owners of private properties for quarrying and transporting materials and machinery over properties and roads. Obtain associated permits and pay associated fees.

.6 Adhere to the No-Go zone restrictions on-site due to archaeological and cultural resource potential.

.7 All work at the Fort Wellington National Historic Site must comply with the Standard and Guidelines for the Conservation of Historic Places in Canada.

1.15 WORK WITHIN HISTORIC SITE BOUNDARIES (Cont'd)

.1 (Cont'd)

.8 Vehicular access routes and staging areas will be restricted to present-day roadways and parking lots. If this is not possible, the use of the protective covering such as geotextile protective mats with a wood chip lift or granular "A" gravel is required. Corridors for machinery access within the site will be determined in consultation with Parks Canada's archaeologist, depending on equipment and construction requirements. All protective measures employed must be removed following construction and the area restored to a pre-construction state. Excavation is not permitted during installation or removal of protective covering.

1.16 NOISE

.1 Fit all construction equipment with standard noise suppression devices. Maintain devices in accordance with manufacturer's requirements. Use smaller, less-disturbing equipment where possible.

.2 Apply the most stringent of 1.14.1 - STANDARD HOURS or the Town of Prescott Anti-Noise By-Law No. 45-81, including all amendments.

1.17 AIR QUALITY

.1 Implement an anti-idling policy for trucks and machinery.

.2 Submit dust control measures to Departmental Representative prior to starting Work. Apply dust control measures during periods of dust generation.

1.18 RELICS ANTIQUES AND WILDLIFE HABITAT

.1 Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Departmental Representative and await Departmental Representative's written instructions before proceeding with work in this area.

1.18 RELICS ANTIQUES AND WILDLIFE HABITAT (Cont'd)	.3	Relics, antiquities and items of historical or scientific interest remain her Majesty's property.
1.19 NATIONAL PARKS ACT	.1	For projects within boundaries of National Historic Sites, perform work in accordance with Parks Canada's Cultural Resource Management Policy and the Standards and Guidelines for the Conservation of Historic Places in Canada.
1.20 PERMITS/ AUTHORITIES	.1	Obtain and pay for permits from authorities as required for the Work. Comply with pertinent regulations of authorities having jurisdiction over the Work. Provide copies of permits to Departmental Representative prior to starting the 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 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
.1 For design of any temporary structures, submit design and supporting data at least 2 weeks prior to beginning work.
.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.3 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Lay down area to be facilitated and approved by Departmental Representative.

.3 Maintain existing services to Fortress site and building and provide for personnel and vehicle access.

.4 Where security is reduced by work provide temporary means to maintain security.

.5 Corridors for machinery access and identified No-Go Zones have been determined in consultation with Parks Canada Archaeologist and are illustrated on Maps in Appendix A.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING SITE

.1 Execute work with least possible interference or disturbance to public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.5 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission before excavation.

.2 Provide for personnel, pedestrian and vehicular traffic.

.3 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

.1 Refer to Section 01 11 00 - WORK SCHEDULE, Item 1.5.3 for work schedule dates and restrictions. Exact dates of work to be confirmed and approved by Parks Canada prior to construction.

.2 Access to the Fort Wellington National Historic Site by heavy and construction vehicles shall be limited.

.3 No constructional activities to occur in zones identified and delineated by Parks Canada's archaeologist as No-Go Zones without prior PCA's approval and ground protection measures in place. All construction activities will be restricted to present-day roadways, pathways and parking lots. There are No-Go Zones inside of the Fort itself: Casemates in the earthworks, foundations from past structures below ground. Machinery will not be permitted on corridors inside the Fort which have been indicated by Parks Canada's archaeologist.

1.6 SPECIAL REQUIREMENTS (Cont'd)

.4 Vehicular access routes and staging areas will be restricted to present-day roadways and parking lots. If this is not possible, the use of protective covering such as geotextile protective mats with wood chip lift or granular "A" gravel is required. Corridors for machinery access within the site will be determined in consultation with Parks Canada's archaeologist, depending on the equipment construction requirements. All protective measures employed must be removed following construction and the restored to a pre-construction state. Excavation is not permitted during installation or removal of protective covering.

.5 No-Go Zones and machinery corridors have been identified on Map in Appendix A.

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 GENERAL REQUIREMENTS

.1 The form of Tender includes one lump sum priced item, and several priced items.

.2 The Total Tendered price shall be the sum of the lump sum item plus the amounts calculated from the unit priced items based on the approximate quantities identified for each of the unit priced items.

.3 The Contractor in submitting their Tender for the project understands that they will only be entitled to payment under the unit priced items when prior written authorization has been received from the Departmental Representative for utilization and then only to the extent of the work authorized by the Departmental Representative.

.4 The quantities listed in the Form of Tender are approximate only and are for the purpose of tendering. Payment to the Contractor will be based on actual quantities of work completed in accordance with the drawings and specifications.

.5 Unit priced items are included in this Contract for possible work which may or may not be required to complete the project, for which an accurate assessment of the quantity of the item cannot be made until the work is in progress.

.6 The requirement for items indicated as Provisional will not be determined until the time of construction. Provisional items shall mean that the unit prices as tendered shall be included in the Tender Price and that the Departmental Representative reserves the right to delete or modify the quantities of these items. Any part of a provisional item not expended shall be deducted in whole from the Total Tendered Price.

1.1 GENERAL REQUIREMENTS (Cont'd)

.7 The submitted tender prices will be inclusive of all costs for the complete supply and installation of all materials, labour and equipment required to complete the work. No separate payment will be made for any testing, inspections, quality control and approvals required by Contractor.

.8 Payment shall be calculated as follows:
.1 The quantity for each pay item on which actual work has been performed shall be measured.
.2 For the lump sum item, multiply the percent completed by the value of the lump sum item.
.3 For each Unit Price item, this quantity shall be multiplied by the applicable Unit Price as provided in the Tender Form.

.9 All measurement shall be along a horizontal plane unless otherwise indicated.

1.2 LUMP SUM ITEM

.1 No separate measurement for payment shall be made for any work completed under this item.

.2 Lump Sum items must be broken down for payment measurements within 15 days of contract award.

.3 The work of each lump sum item below shall be considered to include, but not necessarily be limited to the following:
.1 Mobilization and demobilization to the site, access to the site, temporary utilities, construction facilities and temporary barriers and enclosures.
.2 Protection of all cultural and archaeologically significant features/ resources.
.3 All environmental protection, including erosion controls, sedimentation controls, de-watering, dust control, and ground protection measures.
.4 Pre and post construction condition surveys of all existing features adjacent to the area of work.

1.2 LUMP SUM ITEM (Cont'd)

.3 (Cont'd)

.5 Post construction topographic field survey and Survey of existing palisade post tips at anchor post locations to confirm existing elevations and for layout of the construction work items and for collection of as-built condition information.

.6 Cleaning of work site, including removal of waste, debris and recyclable materials.

.7 Testing, inspections and permits from all regulatory agencies and groups required to complete work.

.8 Design, construction and maintenance of all temporary structures (shoring, bracing, underpinning, scaffolding, etc.) required to complete the work.

.9 Removal of all surplus materials from the site at completion of work.

.10 Preparation and submission of all closeout submittals, maintenance manuals and as-built drawings.

.11 Restoration of all areas disturbed by construction activities to equivalent original condition or better.

.12 All other works which are required for completion of the project, exclusive of those covered by the unit priced items.

.4 Fortification Elements:

.1 Stripping of any topsoil and stockpiling for re-use, excavation to lines and elevations indicated on drawings and approved by Departmental Representative, and disposal of surplus or unsuitable material. Material deemed suitable for re-use shall be stockpiled on site with proper ground protection measures in place.

.2 Supply and installation of all topsoil, sod, seed and fill for reinstatement as indicated on drawings.

.5 All and any items not specifically included in the unit price items are considered incidental to the work and are to be included in the lump sum portion of the work.

1.3 UNIT PRICE ITEMS

.1 Unit prices are full compensation for the work necessary to complete each item in the Contract and in combination for all work necessary to complete the Work as a whole.

.2 For each item, include all of the following as required where individual quantities are not provided in the Form of Tender: common excavation, shoring, dewatering, bedding, backfilling, compaction, disposal of surplus materials, insulation, marker stakes, reinstatement of all surfaces with matching materials and thicknesses of the surrounding areas and all incidentals.

.3 All measurement shall be along a horizontal plane unless otherwise indicated.

.4 Palisade - Single Wall:
.1 Unit of Measurement: metre (m)
.2 Method of Measurement: along top of wall
.3 This item includes: Removal of existing timber elements and associated anchorage from Palisade, disposal of posts supply and installation of new palisade wall including cedar posts with hollow centre, steel post and screw piles, connections, anchorage, stringers, fastenings and hardware.

.5 Palisade - Double Wall:
.1 Unit of Measurement: metre (m)
.2 Method of Measurement: along top of wall
.3 This item includes: Removal and disposal of timber elements and associated anchorage which make up the existing double wall wall of the palisade, supply and installation of new palisade wall including cedar posts with hollow centre, steel post and screw piles, connections, anchorage, stringers fastenings and hardware.

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 SPECIFIED ELSEWHERE

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

1.2 APPOINTMENT AND PAYMENT

.1 Departmental Representative will appoint and pay for services of testing laboratory except as follows:
.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
.2 Inspection and testing performed exclusively for Contractor's convenience.
.3 Testing, adjustment and balancing of equipment and systems.
.4 Mill tests and certificates of compliance.
.5 Tests specified to be carried out by Contractor under the supervision of Departmental Representative.
.6 Additional tests specified in the following paragraph.

.2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

.1 Provide labour, equipment and facilities to:
.1 Provide access to Work to be inspected and tested.
.2 Facilitate inspections and tests.
.3 Make good Work disturbed by inspection and test.
.4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

1.3 CONTRACTOR'S RESPONSIBILITIES (Cont'd)

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

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 DEFINITIONS

.1 Activity: An element of Work performed during course of Project. An activity normally has an expected duration, an expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart). A graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: Original approved plan (for Project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: Number of work periods (not including holidays or other nonworking periods) required to complete an activity or other Project element. Usually expressed as workdays or workweeks.

.6 Master Plan: A summary-level schedule that identifies major activities and key milestones.

.7 Milestone: A significant event in Project, usually completion of major deliverable.

1.1 DEFINITIONS (Cont'd)

.8 Project Schedule: The planned dates for performing activities and the planned dates for meeting milestones. A dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: Overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

.1 Submit to Departmental Representative within 5 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.2 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

.1 Project milestones to form targets for Project Schedule.

.1 Period to reach substantial completion to match 2-year work schedule provided. Refer to Section 01 11 00, Part 1.5 PROJECT SCHEDULE, Item 1.5.3.

.2 Ensure city noise by-laws are respected in reaching project milestones.

1.5 MASTER PLAN

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

.2 Departmental Representative will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes at minimum milestone and activity types as follows:

.1 Award.
.2 Shop Drawings.
.3 Post tip survey at anchor post locations
.4 Permits.
.5 Mobilization.
.6 Existing palisade demolition and new palisade construction.

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule every 2 weeks reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

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 SECTIONS

.1 Section 01 11 00 -General Instructions.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 78 00 - Closeout Submittals.

1.2 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an 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 Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

1.2 ADMINISTRATIVE (Cont'd)

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.10 Keep one reviewed copy of each submission on site.

.11 Make any changes in submissions which Departmental Representative may require consistent with Contract Documents and resubmit as directed by Departmental Representative.

.12 Notify Departmental Representative, in writing, when resubmitting of any revisions other than those requested by Departmental Representative.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow 10 working days for Departmental Representative's review of each submission.

1.3 SHOP DRAWINGS AND PRODUCT DATA (Cont'd)

.4 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.

.6 Accompany submissions with transmittal letter, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Corresponding specification section.
- .6 Other pertinent data.

.7 Submissions shall 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 Relationship to adjacent work.

1.3 SHOP DRAWINGS AND PRODUCT DATA (Cont'd)

.7 (Cont'd)

.5 (Cont'd)

.8 After Departmental Representative's review, distribute copies.

.9 Submit 1 PDF digital file of shop drawings for each requirement requested in the Specification sections and as Departmental Representative may reasonably request.

.10 Submit 1 PDF digital file of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.11 Delete information not applicable to project.

.12 Supplement standard information to provide details applicable to project.

.13 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.4 SAMPLES

.1 Samples: examples of materials, equipment quality, finishes, workmanship.

.2 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.

.3 Deliver samples prepaid to Departmental Representative's business address.

.4 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

1.4 SAMPLES (Cont'd)

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 PROGRESS PHOTOGRAPHS

.1 Submit electronic copy of colour digital photographs in "jpg" format.

.2 Identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: locations of viewpoints determined by Departmental Representative.

.4 Frequency: monthly and at completion excavation and services before concealment.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

1.7 WORK SCHEDULE

.1 Provide within 5 working days after contract award, schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents.

.2 Work schedule should be updated every two weeks to reflect progress.

.3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

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 SECTIONS

.1 Section 01 33 00 - Submittal procedures.

1.2 REFERENCES

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

.2 Province of Ontario
.1 Occupational Health and Safety Act, and regulations for noise and construction projects, R.S.O. 1990, c.0.1 as amended 2016, c.2, Sched. 4.0. Reg. 381/15 and O. R213/91 as amended - updated 2016.

1.3 SUBMITTALS

.1 Make submittals 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 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.

.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 Material Safety Data Sheets (MSDS) to Departmental Representative.

1.3 SUBMITTALS (Cont'd)

.7 Departmental 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 Departmental Representative within 7 days after receipt of comments from Departmental Representative.

.8 Departmental Representative's review of Contractor's final Health and Safety plan shall not be construed as approval and does not reduce the Contractor's full responsibility for construction Health and Safety.

.9 PCA Health and Safety Attestation must be reviewed and signed by Contractor prior to commencement of the Work.

.10 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

.11 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

.12 Submit other data, information and documentation upon request as stipulated elsewhere in this section.

.13 Refer to Section 01 11 00, 1.12 - CONSTRUCTION SAFETY MEASURES, Item 1.12.2.

1.4 FILING OF NOTICE

.1 File Notice of Project and other Notices with provincial authorities prior to commencement of Work.

.2 Upon request, Departmental Representative will provide name and mailing address of provincial department to whom the Notice of Project shall be sent.

1.5 HAZARD ASSESSMENT

.1 Implement and carry out a health and safety hazard assessment program as part of the work. Program to include:

.1 Initial hazard assessment carried out immediately upon notification of contract award prior to commencement of Work.

.2 Ongoing hazard assessments performed during the progress of work identifying new or potential health risks and safety hazards not previously known. As a minimum, hazard assessments shall be carried out when:

.1 New sub-trade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.

.2 The scope of the work has been changed by Change Order.

.3 Potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety representative.

.3 Hazard assessments to be project and site specific, based on review of contract documents, site and weather conditions.

.4 Each hazard assessment to be made in writing. Keep copies of assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work. Have Contractor's Site Superintendent in attendance. Departmental Representative will advise of time and location.

.2 Provide site safety orientation session to all workers and other authorized persons prior to granting them access to work site. Brief persons on site conditions and on the minimum site safety rules in force at the site.

.3 Conduct site-specific occupational health and safety meetings during the entire work as follows:

1.6 MEETINGS (Cont'd)

.3 (Cont'd)
.1 Formal meetings on a minimum monthly basis.
.2 Informal "tool box" meetings on a regular basis from a predetermined schedule.

.4 Keep workers informed of anticipated hazards, on safety practices and procedures to be followed and of other pertinent safety information related to:
.1 Progress of work;
.2 New sub-trades arriving on site, and;
.3 Changes in site and project conditions.

.5 Record and post minutes of meeting. Make copies available to Departmental Representative upon request.

1.7 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to commencing any site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Health and Safety Plan shall contain the following three (3) parts:
.1 Part 1: List of individual health risks and safety hazards identified by hazard assessments.
.2 Part 2: List of specific measures to control or mitigate each hazard and risk identified in part one of Plan. Describe the engineering controls, personnel protective equipment and safe work practices to be implemented and followed when performing work related to each identified hazard or risk.
.3 Part 3: Emergency Measures and Communications Procedures as follows:

1.7 GENERAL REQUIREMENTS (Cont'd)

.2 (Cont'd)

.3 (Cont'd)

.1 Emergency Measures: on-site operating procedures, evacuation measures and emergency response to be implemented in the occurrence of an incident. Procedures to be specific and relevant to identified hazards. Measures to complement and be integrated with the facility and tenants Emergency Response Plans in place at site. Obtain information on existing emergency and evacuation plans from Departmental Representative and incorporate appropriate data.

.2 Communication Procedures:

.1 List of names and telephone numbers of designated officials, to be contacted should an incident or emergency situation occur, including the following.

.1 General Contractor and all Subcontractors. Federal and Provincial Departments and local emergency resources organizations, as resources organizations, as applicable laws and regulations.

.2 Officials from Parks Canada Agency. Departmental Representative will provide list of names to be included.

.2 Procedures implemented at site to communicate and share information between workers, subcontractors, and General Contractor on work activities and in particular those which might endanger workers and Facility employees.

1.7 GENERAL REQUIREMENTS (Cont'd)

.2 (Cont'd)

.3 (Cont'd)

.3 List of critical construction activities to be communicated with the Facility Manager and designated tenant representatives which could affect facility and tenant operations, or pose a risk to the health and safety of their employees and to the general public. Develop list in consultation with the Departmental Representative.

.3 Prepare Health and Safety Plan in a three column format, addressing the three parts specified above, as follows:

Column 1 Identified Hazard	Column 2 Control Measures Implemented	Column 3 Emergency Measures and Communications Procedures

.4 Develop Health and Safety Plan in collaboration with all subcontractors. Address all work and activities of subcontractors as they arrive on site. Immediately update Plan and submit to Departmental Representative.

.5 Implement, maintain and enforce compliance with requirements of the Health and Safety Plan until final completion of work and demobilization from site.

.6 As work progresses, review and update Plan addressing additional health risks and safety hazards identified by on-going hazard assessments.

.7 Submit revised versions of Plan to Departmental Representative.

.8 Post a typed written copy, including all updates of the Health and Safety Plan in a common visible location at work site.

1.7 GENERAL REQUIREMENTS (Cont'd)

.9 Submission of the Health and Safety Plan, and updates to the Departmental Representative is for review and information purposes only. Its submission shall not be construed to imply approval by Departmental Representative, be interpreted as a warranty of being complete, accurate and legislate compliant and shall not relieve the Contractor of his legal obligations for the provision Health and Safety of the Construction Project.

.10 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 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.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations made under part II of the Canada Labour Code.

.3 Observe and enforce construction safety measures required by:

.1 2015 National Building Code of Canada, Part 8;

.2 Provincial Worker's compensation Board;

.3 Municipal Statutes and ordinances.

1.9 COMPLIANCE REQUIREMENTS (Cont'd)

.4 In event of conflict between any provisions of above authorities the most stringent provision shall apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

.5 A copy of the Canada Labour Code Part II may be obtained by contacting:
Canadian Government Publishing
Public Works & Government Services Canada
Ottawa, ON, K1A 0S9
Tel: (819) 956-4800 or 1-800-635-7943

1.10 UNFORESEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Departmental Representative verbally and in writing.

1.11 HEALTH AND SAFETY COORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
.1 Have minimum 2 years' site-related working experience specific to activities.
.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.

1.12 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 Departmental Representative.

1.12 POSTING OF DOCUMENTS (Cont'd)

.2 Post all permits on site. Submit copies to Departmental Representative.

1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 BLASTING

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

1.15 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.16 WORK STOPPAGE

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

1.17 SITE CONTROL AND ACCESS

.1 Control work site and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop unauthorized persons from circulating within construction areas and remove from site.

.2 Implement procedures for granting permission to enter into work site to all persons who require access. Procedures to include the provision of a site safety orientation session.

.3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required.

1.17 SITE CONTROL AND ACCESS (Cont'd)

.4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction area(s) as being "off limits" to unauthorized persons. Signage must be professionally made in both official languages or by use of well-understood graphic symbols.

.5 Secure site at night time or provide security guard(s) as deemed necessary to protect site against entry.

.6 Ensure persons granted access are fitted and wear appropriate personnel protective equipment (PPE). Be responsible for the provision of such PPE to persons who require access to conduct work or perform inspections.

1.18 PROTECTION

.1 Provide temporary facilities for protection and safe passage of public pedestrians and vehicular traffic around adjacent work site.

.2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.

.3 Carry out work placing emphasis on health and safety of public, site personnel and protection of the environment.

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

1.19 PERMITS

.1 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.

1.19 PERMITS (Cont'd)

.2 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain Departmental Representative's approval to proceed prior to carrying out that portion of the work.

1.20 MINIMUM SITE SAFETY RULES

.1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements at the work site and obeyed by all persons granted access:
.1 Wear personal protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat and safety footwear. Wear eye protection where appropriate.
.2 Immediately report unsafe activities, conditions, near-miss accidents, injuries and damages.
.3 Maintain site in tidy condition.
.4 Obey warning signs and safety tags.

.2 Brief workers on site safety rules, and on the disciplinary measures to be taken for violation or non-compliance of such rules. Post such information on site.

1.21 TOOLS AND EQUIPMENT SAFETY

.1 Implement and follow a scheduled tool and equipment inspection/maintenance program at work site. Regularly check tools, equipment and machinery for safe operation and perform maintenance at pre-established time and frequency intervals as recommended by manufacturer. Include subcontractors equipment as part of the inspection process.

.2 Use standardized checklists to ensure established safety checks are stringently followed.

.3 Immediately tag and remove items found faulty or defective off site.

.4 Maintain written documentation on each inspection. Make available to Departmental Representative upon request.

1.22 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information Systems (WHMIS).

.2 Keep MSDS data sheets on site. Provide copies of all data sheets to Departmental Representative upon receipt of materials on site.

.3 Put all MSDS data sheets on site, in a common area, visible to workers.

1.23 PROJECT / SITE CONDITIONS

.1 The following are known or potential project related safety hazards at site:
.1 Overhead Power Lines.
.2 Excavations and Trenches.
.3 Environment (Extreme weather).
.4 Working at heights.
.5 Steep Embankments.

.2 Obtain from Departmental Representative, copy of MSDS Data sheets of existing hazardous materials stored on site or being used by Facility and Tenant personnel in the course of their operations.

.3 Above lists shall not be construed as being complete and inclusive of safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.24 ACCIDENT REPORTING

.1 Investigate and report incidents and accidents as outlined in Provincial Occupational Safety and Health Act and Regulations.

.2 Investigate and immediately report to Departmental Representative incidents and accidents which results, or has the potential of resulting in:
.1 Injuries requiring medical aid.
.2 Property damage in excess of $5,000.00.
.3 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.

1.24 ACCIDENT REPORTING (Cont'd)

.3 Medical aid in above clause shall have the same meaning as the term "medical aid injury" as defined in the Canadian Dictionary of Safety Terms - 1987 issue, from the Canadian Society of Safety Engineers (C.S.S.E.) as follows:

.1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.

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 DESCRIPTION

.1 This Section describes requirements for the protection of the environment that apply to the Work. These requirements apply to all Sections of this Specification, without limiting the conditions and approvals imposed by statute.

.2 Control work to provide effective environmental protection. Departmental Representative will monitor environmental protection measures and will identify whenever such protection is found to be ineffective. Change protective measures or work procedures as directed by Departmental Representative to ensure environmental.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittals Procedures.

.2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
.1 Environmental Protection Plan to present comprehensive overview of known or potential environmental issues to be addressed during construction.
.2 Environmental Protection Plan to be prepared in accordance with requirements of Federal, Provincial and Municipal laws and regulations for review by Departmental Representative and PCA Environmental Impact Assessment Officer.

.3 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.4 Environmental Protection Plan to include:
.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
.3 Names and qualifications of persons responsible for training site personnel.

1.2 SUBMITTALS (Cont'd)

.4 (Cont'd)

.4 Description of environment protection personnel training program.

.5 Erosion, sediment and dust control plan which identifies type and location of erosion, sediment and dust controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion, sediment and dust control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Work area plan showing proposed activity in each portion of site and identifying No-Go zones.

.1 Work area plan to include measures for marking limits of use areas including methods for protection of features (i.e. ground protection system in No-Go zones) to be preserved within authorized work areas.

.2 No-Go zones have been identified in Appendix A. Machinery will be permitted on construction corridors inside the fort which have been indicated in Appendix A.

.8 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.9 Up-to-date emergency response contact list including contact information for reporting spills.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and are contained on project site.

1.2 SUBMITTALS (Cont'd)

.4 (Cont'd)

.12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste water management plan that identifies methods and procedures for management and discharge of waste waters which are directly derived from construction activities, clean-up water, dewatering of ground water, disinfection water.

.14 Historical, archaeological, cultural resources, biological resources and plan that defines procedures for identifying and protecting historical, archaeological, cultural and biological resources.

.15 Plant and Tree Protection Plan (including plan to restore all vegetated areas disturbed by construction activities to original conditions or better).

.16 Invasive/Alien species control plan (i.e., preventative measures to avoid bringing invasive species to the site).

.17 Wildlife Protection Plan.

.5 Product Data: Submit manufacturer's instructions, printed product literature, data sheets and WHMIS MSDS sheets.

1.3 EXPLOSIVES

.1 Use of explosives is prohibited.

1.4 FIRES

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

1.5 DEFINITIONS

.1 Drip line: location on the ground surface directly beneath a theoretical line described by the tips of the outermost branches of the trees.

.2 Barrier: fence consisting of approved material, supported by steel posts and being a minimum of 1.8m high, without breaks or unsupported sections.

1.6 EROSION, SEDIMENT AND DUST PROTECTION

.1 Prior to starting work that will create dust or debris, such as improvements to access, removal, excavation or backfilling, install effective mitigation techniques for erosion, sediment, dust and debris control in accordance with Federal, Provincial and Municipal laws and regulations. Maintain these protective measures at all times, including during shut down periods.

.2 Maintain effective surface drainage and direct runoff away from work areas and into adequately vegetated areas.

.3 Excavation to cease during periods of heavy rainfall, unless runoff is contained from entering waterway.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

1.7 PLANT AND TREE PROTECTION

.1 Care shall be taken to protect existing landscape and plant material including trees, plants, garden vegetation on site and adjacent properties.

.2 Limit clearing, grubbing, and tree-branch removal to areas of work or access indicated on approved shop drawings.

.3 Provide barriers around trees and gardens which may be affected by work, including staging areas.
.1 Locate barrier 1 metre beyond Drip line.
.2 Barrier to consist of protective wood framework covered with plastic construction fence material, extending from grade level to a height of 2 metres.
.3 Maintain barriers in good repair throughout duration of Work.
.4 Remove barriers upon completion of Work.

.4 Damage to trees due to Contractor's operations to be addressed as follows:

1.7 PLANT AND TREE PROTECTION (Cont'd)

.4 (Cont'd)

.1 Broken branches 25 mm or greater in diameter: cut back cleanly at break, or to within 10 mm of their base, if substantial portion of branch is damaged Departmental Representative will direct.

.2 Exposed roots 25 mm or larger: cut back cleanly to soil surface within five calendar days of exposure.

.3 Damaged bark: neatly trim back to uninjured bark, without causing further injury, within five calendar days of damage.

.5 Reduce soil displacement and compaction by using heavy machinery in designated areas with proper ground protection system or on existing vehicle paths.

.6 Replace damaged lawn and gardens to pre-construction state with topsoil and sod and/or sod.

.7 Avoid using heavy machinery on saturated ground.

.8 Use equipment of low bearing weight and low pressure tires wherever possible.

.9 To minimize the risk of introducing invasive species: all soil, gravel, erosion and sediment control products (e.g. hay, straw, mulch) from outside the protected heritage place much be approved by the designated Parks Canada staff.

1.8 WILDLIFE MITIGATION

In the event that an unexpected wildlife situation arises or a species at risk is found on site or encountered during construction activities, all work will cease and a Parks Canada representative will be contacted immediately to assist with mitigation measures.

.2 Possible species at risk and wildlife encounters include: nesting birds, roosting or hibernating bats, and basking or hibernating snakes.

1.8 WILDLIFE MITIGATION (Cont'd)

.3 Avoid disturbing perimeter ditch, if possible, during the period between Mid March and Mid May. As the ditch can have standing water during this time and it is a possible breeding area for frogs (possibly including the Western Chorus Frog - a species at risk). For any work affecting ditch that must be done during this period, a frog survey will need to be completed by a designated PCA Representative (and possible mitigations implemented) before work can commence.

1.9 OPERATION AND MAINTENANCE OF EQUIPMENT

.1 Equipment and heavy machinery to meet or exceed applicable emission requirements.

.2 Leave machinery running only while in actual use, except where extreme temperatures prohibit shutting machinery down.

.3 Vehicle and equipment maintenance and refueling to be conducted over impermeable/absorptive material situated at a designated area that is located at least 30 m away from nearest waterway.

1.10 REMOVED MATERIALS

.1 Unless otherwise specified, materials designated for removal become Contractor's property. Remove these from site.

1.11 HAZARDOUS MATERIALS

.1 Place materials defined as hazardous or toxic waste in designated containers.

.2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program.

.3 Store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary.

1.12 CLEAN-UP

.1 Clean up work area continuously as work progresses.

1.12 CLEAN-UP (Cont'd)

.2 At end of each work period, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

.3 Permit no amount of debris, trash or garbage to accumulate on-site.

.4 Do not bury rubbish on site.

.5 Separate and recycle materials that can be recycled.

.6 Dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner by taking them to special designated waste facility. Do not dump these into storm or sanitary sewers.

.7 Spills:

.1 Have environmental emergency response plan in place, spill kit and other materials readily available on-site to respond quickly if spills occur.

.2 Report spills immediately to Departmental Representative and Ontario Ministry of Environment Spills Action Centre (Telephone No. 1-800-268-6060).

.3 Secure source of spill to stop flow of spill and isolate area of spill.

.4 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material, or absorbent pads.

.5 Clean-up, remove and dispose of contaminated materials in accordance with MSDS or as directed by Ontario Ministry of Environment.

.6 Be responsible for costs of cleaning up spills to satisfaction of Departmental Representative.

1.13 DISPOSAL OF WASTE MATERIALS

.1 Waste subject to Ontario Environmental Protection Act to be transported with valid "Certificate of Approval for a Waste management System" to site approved by Ontario Ministry of the Environment to accept that waste.

1.13 DISPOSAL OF WASTE MATERIALS (Cont'd)	.2	Obtain and submit Waste Generator Numbers, permits, manifests, and other paperwork necessary to comply.
1.14 NOISE CONTROL	.1	Refer to Section 01 11 00 GENERAL INSTRUCTIONS, 1.17 - NOISE.

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 REFUELING

.1 Refueling of equipment to be performed in locations as directed by Departmental Representative.

.2 Do not refuel equipment within 30 metres of any storm water catch basin unless protection against spills is in place and location is approved by Departmental Representative.

.3 Use petroleum containers approved for products with no spill fill spouts for dispensing fuels. The sure pour nozzle to have self closing valve, prevent any flow of fuel until the nozzle is inserted into the receiving container. On removal from the receiving container the slide valve closes to eliminate any fuel spill. Nozzle to be equipped with its own automatic vent eliminating the need for the user to open or close air inlets on the pouring container.

.4 Nozzle to support the weight of the pouring container. Nozzles to automatically stop the flow when the receiving container becomes full. The nozzle to be such that it reduces evaporative losses of volatile organic compounds during the fuel transfer.

.5 All spills of hydrocarbon based products such as gasoline, kerosene, naphtha, lubricating oils, engine oils, greases and de-icing fluids or antifreeze no matter how large or small to be reported to Departmental Representative and the Park Canada's Environmental Protection Officer (EPO). Spills in excess of 100 Litres must also be reported to the Spills Action Centre - Ontario Ministry of the Environment 1-416-325-3000 or 1-800-268-6060.

.6 Oil changes or equipment repairs in the field or on Parks Canada land are not permitted.

.7 Refueling to be performed on level surfaces, PCC Portland cement concrete or HMAC surfaces when approved by the Departmental Representative unless otherwise directed.

1.1 REFUELING (Cont'd)

.8 Contractor to have drip pans sized for amounts of product to be recovered and customized to fit under pieces of equipment to perform routine maintenance to equipment while maintaining equipment on property. Drip Pans to be used whenever leaving equipment on site or parking overnight when not in use.

.9 Parking of equipment on site to be on level ground in locations away from watercourses and as approved by Departmental Representative. Equipment with leaks or poor mechanical repair to be removed from site when so ordered by Departmental Representative.

.10 No refueling to be conducted on Parks Canada Property.

1.2 SPILL CONTROL KIT

.1 Contractor to have at the work site a spill control kit consisting of the following minimum types of equipment:
.1 a spaded shovel;
.2 a stable broom;
.3 a broad nosed shovel;
.4 a container(s) suitable, compatible to and of sufficient size to contain petroleum products being used with equipment;
.5 absorbents;
.6 rags;
.7 metal container for soiled rags;
.8 Booms when working next to a watercourse that will traverse the width of the watercourse by two times; and
.9 Spill control kit to be inspected and approved by both the Ontario Department of Environment and the Departmental Representative prior to Work commencing. Spill control kits to be available to Contractor employees at all areas where Work of the Contract is being performed and at all times during the course of the Contract.
.10 Contractor employees to be trained in the use of the spill control kit and the equipment they contain.

1.3 SPILLS

.1 Disposal of spilled materials to be off Parks Canada property and at approved locations for materials to be disposed of.

1.3 SPILLS (Cont'd)

.2 When parking of equipment on site, the equipment is to be secured from entry, inspected for leaks and the ground protected from leaks.

.3 Contractor to protect all wells, catch basins, drywells, drains and watercourses from contamination in event of a spill.

.4 All equipment to be used for the Work of the Contract to be inspected by the Departmental Representative for leaks. Equipment not in good repair to be removed/repaired when directed by Departmental Representative.

.5 Spills in excess of 74 litres to be reported immediately to Departmental Representative, the Park's Environmental Protection Officer (EPO) and the Ontario Department of Environment.

.6 Contractor to immediately remove as much or all of the contaminated soils as possible, from any spills created from Work of the Contractor.

.7 Contaminated soils/materials to be placed in containers compatible to the contaminants.

.8 Any remaining clean-up to be performed at no extra cost to Parks Canada. Clean-up to be to the Departmental Representative's satisfaction.

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 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Provide 72 hour notice requesting inspection via emails if Work is designated for special tests, inspections or approvals by Departmental Representative instructions. Contractor shall follow-up with a phone call to Departmental Representative should no email response be received.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative may order any 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. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

1.2 INDEPENDENT INSPECTION AGENCIES (Cont'd)

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.3 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.

1.4 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site.

1.5 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

1.5 REJECTED WORK (Cont'd)

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.

1.6 REPORTS

.1 Submit 1 PDF copy of inspection and test reports to Departmental Representative.

.2 Provide copies to Subcontractor of work being inspected or tested.

1.7 MILL TESTS

.1 Submit mill test certificates as required of specification Sections.

1.8 MOCK UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in location acceptable to Departmental Representative.

.3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups 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.

.5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

.6 Mock-ups may remain as part of Work unless indicated otherwise.

1.9 MOCK UPS REQUIRING MULTIPLE TRADES

.1 Palisades Mock-Up

.1 Construct full-scale mock-up consisting of thirteen (13) full-height palisade posts, plus six (6) half-height double-wall vertical members. Full-height posts include three (3) full-height anchor posts plus ten (10) full-height intermediate posts. Construct one-half length of the wall as "single wall" construction as detailed on design drawings. The other half length of the wall will represent "double wall" construction. Construct the mock-up to show post sizing and preparation, foundation construction, steel connections, stringers, historical nailing, anchorage and workmanship.

.2 Mock-Up used:

.1 To judge workmanship, preparation, operation of equipment and material installation and application.

.3 Construct mock-up where directed by Departmental Representative.

.4 Allow 4 business days for inspection of mock-up by Departmental Representative before proceeding with work.

.5 When accepted by Departmental Representative, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

.6 Start work only upon receipt of written acceptance of mock-up by Departmental Representative.

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 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use or as directed by Departmental Representative.

1.2 DEWATERING

.1 Provide temporary drainage to keep site free from standing water.

.2 Ensure discharge is not contaminated with sediment, oil, etc.

1.3 TEMPORARY POWER AND LIGHT

.1 Departmental Representative will not provide or pay for temporary power during construction for temporary lighting and operating of power tools.

.2 Arrange for connection with appropriate utility company. Pay all costs for supply, installation, maintenance and removal.

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project.

.5 Coordinate with all Parks Canada Staff.

.6 Supply and install temporary facilities for power to approval of local power supply authorities.

.7 Provide and pay for temporary power and lights for use of Departmental Representative site office.

1.4 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, fax and data hook up, line(s) and equipment as necessary for own use.

1.5 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

1.5 FIRE PROTECTION (Cont'd)

.2 Burning rubbish and construction waste materials is not permitted on site.

1.6 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.7 STORAGE SHEDS

.1 Provide adequate weather-tight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-Z321-96 (R2006), Signs and Symbols for the Occupational Environment.

1.2 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

.3 Refer to site location plan indicting approved locations of area to be used by Contractor for trailer(s) and temporary washroom facilities. Prepare site plan for review indicating exact location and dimensions of area to be used, avenues of ingress/egress and details of fence installation as applicable.

.4 Indicate use of supplemental or other staging area.

1.3 HOISTING

.1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists cranes shall be operated by qualified operator.

1.4 SITE STORAGE/LOADING

.1 Contractor's use of site storage and loading shall be limited to an area within limits of traffic diversion. Any conditional areas required shall be approved by Departmental Representative prior to use.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.5 CONSTRUCTION PARKING

.1 Parking will be permitted at Fort Wellington visitor center parking lot for contractor vehicles and equipment required to carry out work, as directed by Departmental Representative.

1.5 CONSTRUCTION PARKING (Cont'd)

.2 Provide and maintain adequate access to project site.

.3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

.4 Limit parking on public roadways as to avoid congestion during operational hours.

1.6 SECURITY

.1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays, if applicable.

1.7 OFFICES

.1 Provide office space for own use as required. Locate office on site to satisfaction of Departmental Representative.

.2 Provide a clearly marked and fully stocked first-aid case in a readily available location.

.3 Subcontractors may provide their own offices as necessary. Location of these offices to be to the satisfaction of the Departmental Representative.

1.8 EQUIPMENT TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a 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 a manner to cause least interference with work activities.

1.9 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.10 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site.

1.10 CONSTRUCTION SIGNAGE (Cont'd)

.2 Signs and notices for safety and instruction shall be in both official languages Graphic symbols shall conform to CAN3-Z321.

.3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.11 CLEAN-UP

.1 Clean continuously as work progresses.

.2 Remove construction debris, waste materials, packaging material from work site daily.

.3 Clean dirt or mud tracked onto paved or surfaced roadways.

.4 Store materials resulting from demolition activities that are salvageable.

.5 Stack stored new or salvaged material not in construction facilities.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 51 00 - Temporary Utilities.

.2 Section 01 52 00 - Construction Facilities.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 GUARD RAILS AND BARRICADES

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

.2 Provide as required by governing authorities.

1.4 ACCESS TO SITE

.1 Provide and maintain access roads, as may be required for access to Work.

1.5 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent Traffic Control Persons, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.6 FIRE ROUTES

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

1.7 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.

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 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.2 QUALITY

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

1.2 QUALITY (Cont'd)

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout project site.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions.

1.3 AVAILABILITY

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

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

.3 If only 1 product is approved and listed in a specification section but is no longer available, a proposed alternate must meet all the criteria of the specified product and be approved by Departmental Representative.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

1.4 STORAGE, HANDLING AND PROTECTION (Cont'd)

.4 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.5 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

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

.2 Transportation cost of products supplied by Departmental Representative will be paid for by Departmental Representative. Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

1.7 QUALITY OF WORK (Cont'd)

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 COORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

1.9 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.10 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 QUALIFICATION OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Province of Ontario, acceptable to Departmental Representative.

1.2 SURVEY REFERENCE POINTS

.1 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.2 Make no changes or relocations without prior written notice to Departmental Representative.

.3 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.4 Require surveyor to replace control points in accordance with original survey control.

1.3 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established Ontario geodetic control database bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement.

.4 Stake slopes.

.5 Establish pipe invert elevations and location of any exposed pipe not being removed under this contract.

.6 Record elevation and location of all existing and installed end caps of abandoned underground services.

.7 No machinery or heavy equipment will be permitted on the parapet during construction. Parapet is defined as the area between the revetment logs and the log fraise.

1.3 SURVEY REQUIREMENTS (Cont'd)

.8 Provide survey elevations and coordinates to Departmental Representative for review and approval prior to any work on site begins to allow for confirmation of design.

.9 All elevations to be reinstated to existing unless otherwise noted.

1.4 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

1.5 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of site works, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.6 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform with Contract Documents.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Departmental Representative or other Contractors.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use clearly marked separate bins for recycling.

.6 Remove waste material and debris from site and deposit in waste container at end of each working day.

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.8 Dispose of waste materials, and debris off site at approved facilities.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.

1.2 FINAL CLEANING (Cont'd)

.4 Remove waste products and debris other than that caused by Departmental Representative or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Sweep and wash clean paved areas.

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 DEFINITIONS

.1 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.2 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

.3 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.4 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.5 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
.1 Salvaging reusable materials from re-modeling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
.2 Returning reusable items including pallets or unused products to vendors.

.6 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.7 Separate Condition: Refers to waste sorted into individual types.

.8 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

1.2 DOCUMENTS

.1 Maintain at job site, one copy of following documents:
.1 Material Source Separation Plan.

1.3 SUBMITTALS

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

.2 Prepare and submit following prior to project start-up:
.1 Submit 2 copies of Materials Source Separation Program (MSSP) description.

1.4 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare Waste Reduction Work plan.

.2 Structure WRW to prioritize actions and follow as first priority Reuse, then followed by Recycle.

.3 Describe management of waste.

.4 Post work plan or summary where workers at site are able to review its content.

1.5 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up. The DWA with related weight bills and/or receipt must be submitted on a monthly basis with the Contractor's monthly Progress claim.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

1.5 MATERIALS SOURCE SEPARATION PROGRAM (MSSP) (Cont'd)

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
.1 Transport to approved and authorized recycling facility.

1.6 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as specified in MSSP.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of site is endangered, cease operations and immediately notify Departmental Representative.

.7 Protect surface drainage and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.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.

1.7 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, or oil into waterways, storm, or sanitary sewers.

1.7 DISPOSAL OF WASTES (Cont'd)

.3 Keep records of construction waste including:
- .1 Number and size of bins.
- .2 Waste type of each bin.
- .3 Total weight generated.
- .4 Weight reused or recycled.
- .5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.8 USE OF SITE AND FACILITIES

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

1.9 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 APPLICATION

.1 Do Work in compliance with WRW.

.2 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.

END OF SECTION

PART 1 - GENERAL

1.1 INSPECTION AND DECLARATION

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
.2 Request Departmental Representative's Inspection.

.2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:
.1 Work has been completed and inspected for compliance with Contract Documents.
.2 Defects have been corrected and deficiencies have been completed.
.3 Work is complete and ready for Final Inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

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 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection, with Departmental Representative's comments.

.3 Revise content of documents as required prior to final submittal.

.4 If requested, furnish evidence as to type, source and quality of products provided.

.5 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.6 Pay costs of transportation.

1.2 FORMAT

.1 Organize data in the form of an 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. 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 by systems, 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.

1.2 FORMAT (Cont'd)

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dxf or dwg and pdf format on USB Memory Stick or CD.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;
.1 date of submission; names,
.2 addresses, and telephone numbers of Consultant and 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 clearly 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. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.4 AS-BUILTS AND SAMPLES

.1 Maintain at the site for Departmental Representative one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to the Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.

1.4 AS-BUILTS AND SAMPLES (Cont'd)

.1 (Cont'd)
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. 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. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

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

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of opaque drawings, provided by Departmental Representative.

.2 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.3 Contract Drawings and shop drawings: legibly 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 References to related shop drawings and modifications.

.4 Specifications: legibly 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.

1.5 RECORDING ACTUAL SITE CONDITIONS (Cont'd)

.4 (Cont'd)
.2 Changes made by Addenda and change orders.

.5 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.6 FINAL SURVEY

.1 Submit final site survey certificate for construction corridor area, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.7 WARRANTIES AND BONDS

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

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 DESCRIPTION

.1 This section specifies requirements for demolishing and removing wholly or in part various items designated to be removed or partially removed.

.2 Demolition and removal will consist of, but not necessarily be limited to, the following:
.1 Remove existing single and double palisade sections as indicated on the drawings.

1.2 PROTECTION

.1 Protect existing objects designated to remain. In the event of damage, immediately replace or make repairs to approval of, and at no additional cost to, Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 EXECUTION

.1 Inspect site and verify with Departmental Representative objects designated for removal.

3.2 REMOVAL

.1 Do not disturb adjacent work designated to remain in place.

.2 Do not disturb adjacent work designated to remain in place.

3.3 SAFETY CODE

.1 Do demolition work in safe manner and according to applicable laws and regulations from authorities having jurisdiction.

.2 Blasting is not permitted.

3.4 DISPOSAL OF MATERIAL

.1 The Departmental Representative maintains the right of first refusal (as no cost) to demolished material except those designated for reuse.

3.4 DISPOSAL OF MATERIAL (Cont'd)

.2 Upon refusal of demolished materials by the Departmental Representative, such Materials become the property of the Contractor. Remove such materials from sites and dispose in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

3.5 RESTORATION

.1 Upon completion of work, remove debris, trim surfaces and leave work site in clean condition.

.2 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
.1 ASTM A 53/A53M-07, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and seamless.
.2 ASTM A 307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)
.1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel.
.2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CAN/CSA-S16-01 (R2007)), Limit States Design of Steel Structures.
.4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
.5 CSA W59-03, Welded Steel Construction (Metal Arc Welding) (Imperial Version).

.4 The Environmental Choice Program
.1 CCD-047a-98, Paints, Surface Coatings.
.2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.2 SUBMITTALS

.1 Product Data:
.1 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
.1 For finishes, coatings, primers and paints.

.2 Shop Drawings

1.2 SUBMITTALS (Cont'd)

.2 (Cont'd)
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
.2 Indicate materials, core thicknesses, finishes, connections, joints, supports, details, and accessories.

1.3 QUALITY ASSURANCE

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:
.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA-G40.20-04/G40.21-04, Grade 300WT.

.2 Welding materials: to CSA W59-03.

.3 Welding electrodes: to CSA W48-06 Series.

.4 Bolts: to ASTM A 307-04e1.

2.1 MATERIALS (Cont'd)

.5 Stainless Steel: 316 Stainless Steel to CAN/CSA G40.21.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2 to CAN/CSA-G164-M92(R2003).

.2 Unless noted otherwise, all metal fabrications except stainless steel shall be hot dip galvanized.
.1 Touch-up burned or scratched, cut or damaged galvanized surfaces less than 25 mm in any direction with a high-zinc, lead-free galvanizing repair solder to ASTM A780-1. Re-galvanize or replace members with larger galvanizing defects.
.2 Threaded components shall be galvanized to CAN/CSA G164-M92(R2003). Threaded components of each assembly shall be hot-dip galvanized and spun by same process by same supplier and shipped preassembled.

2.4 SCHEDULE OF ITEMS

.1 Miscellaneous metal fabrication items include, but are not limited to, the following:
.1 Channels and members concealed from view: Hot dip galvanized.

PART 3 - EXECUTION

3.1 ERECTION

.1 Do welding work in accordance with CSA W59-03 unless specified otherwise.

3.1 ERECTION (Cont'd)

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Exposed fastening devices to match finish and be compatible with material through which they pass.

.4 Make field connections with bolts to CAN/CSA-S16.1, or weld as indicated.

.5 Touch-up galvanized surfaces with zinc rich primer where burned by field welding or damaged during erection.

3.2 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

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

END OF SECTION

PART 1 - GENERAL

1.1 APPLICATION

.1 This section relates to Rough Carpentry - Palisade Wood Stringers.

1.2 RELATED REQUIREMENTS

.1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal: Waste management and disposal of existing fortifications.

.2 Section 02 41 16 - Demolition & Removal: Waste management and disposal of existing fortifications.

.3 Section 06 10 00 - Rough Carpentry: Palisade Wood Stringers.

1.3 REFERENCE STANDARDS

.1 ASTM International
.1 ASTM A276/A676M-16a, Standard Specification for Stainless Steel Bars and Shapes.
.2 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.

.2 CSA Group (CSA)
.1 CSA/CSA O86-09(R2012), Engineering Design in Wood.
.2 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
.3 CSA O112 Series-M1977(R2006), CSA Standards for Wood Adhesives.
.4 CSA O141-05(R2014), Softwood Lumber.

.3 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2010.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

1.6 DELIVERY, STORAGE AND HANDLING (Cont'd)

.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 Store and protect wood from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 FRAMING STRUCTURAL AND PANEL MATERIALS

.1 Timber for Palisade stringers:
.1 CAN/CSA-O141.
.2 Species: Eastern White Cedar.
.3 Untreated.
.4 All sizes shown are actual sizes of timber (rough), unless noted otherwise.

.2 Furring, blocking, bridging, nailing strips, grounds, rough bucks and fascia backing and sleepers:
.1 S2S is acceptable for all purposes.

2.2 ACCESSORIES

.1 General purpose adhesive: to CSA O112 Series.

.2 Nails, screws, spokes: to CSA B111, exterior grade stainless steel or with organic polymer coating.

.3 Bolts: diameter as specified unless indicated otherwise, complete with nuts and washers. Bolts to be A325, or A307, or 300W Grade.

2.2 ACCESSORIES (Cont'd)

.4 All framing, bridging, blocking, nailing and other details not specified on drawings to be in accordance with Part 9 of Ontario Building Code 2012.

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.

.2 Field verify all dimensions.
.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.2 Proceed with installation only after unacceptable conditions have been remedied.

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 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

.6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.7 Countersink bolts where necessary to provide clearance for other work.

3.2 INSTALLATION (Cont'd)

.8 Comply with Section 01 29 35.06 - Health and Safety Requirements. This section includes special provisions for treated wood.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

PART 1 - GENERAL

1.1 APPLICATION

.1 Timber posts for Palisades.

.2 Connection hardware.

.3 Historical fasteners.

1.2 RELATED REQUIREMENTS

.1 Section 02 41 16 - Demolition and Removal: Waste management and disposal of existing fortifications.

.2 Section 06 10 00 - Rough Carpentry: Stringers for Palisades.

1.3 REFERENCE STANDARDS

.1 ASTM International
.1 ASTM A276/A676M-16a, Standard Specification for Stainless Steel Bars and Shapes.
.2 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.

.2 CSA Group (CSA)
.1 CSA/CSA O86-09(R2012), Engineering Design in Wood.
.2 CAN/CSA S16-2014, Limit States Design of Steel Structures.
.3 CSA B111-1974(R2003) Wire Nails, Spikes and Staples.

.3 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2010.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

.2 Posts in accordance with CSA standards.

.3 Ensure product quality in accordance with Section 01 45 00 - Quality Control.

1.5 QUALITY ASSURANCE (Cont'd)

.4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years experience.

.5 Prior to final fastening of palisades, Departmental Representative will review for aesthetic appearance (i.e. straightness of palisade posts). Straightness of posts to Departmental Representatives satisfaction. Posts found not to be to Departmental Representative's satisfaction shall be considered defective. Refer to 01 45 00 - Quality Control for procedures for defective products.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.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 Store and protect wood from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 TIMBER

.1 Timber used in Palisades. Timber shall be Eastern White Cedar unless noted otherwise.

.2 Rectangular timber shall be rough sawn.

2.1 TIMBER (Cont'd)

.3 Specific characteristics of timber members:
.1 Palisades: treated hand peeled Eastern White Cedar, with four sided point on small end. Dimensions as specified on drawings. Minimum diameter as shown on drawings. Minimum average post diameters as follows:
.1 Anchor Posts: 235 mm
.2 Intermediate Full Height Posts: 220 mm
.3 Half Height Double-Wall Posts: 220 mm

2.2 CONNECTION HARDWARE (CONCEALED FROM VIEW)

.1 Nails, screws, spikes, staples concealed from view: to CSA B111, exterior grade stainless steel or with organic polymer coating.

.2 Bolts concealed from view: diameter as indicated complete with nuts and washers. All bolts to be A325, or A307, or 300W Grade.

.3 Framing, bridging, blocking, fastening in accordance with Part 9 of the OBC 2012.

2.3 HISTORICAL FASTENERS

.1 Historical fasteners to resemble black steel nails as manufactured in 1840's.
.1 Fabricate out of carbon steel to CSA S16 standards for fasteners.
.2 Fastener head shall appear hand-forged in approximate shape as shown on drawings. Shape of fastener heads to vary as much as possible.
.3 Fastener shaft shall be roughly square in shape, with dimensions specified on drawings.

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 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 MATERIAL USAGE

.1 Posts:
.1 Posts with diameters and lengths as indicated on the drawings and specifications.

3.3 INSTALLATION

.1 Install members true to line, levels and elevations, square and plumb.

.2 Posts shall not have grade-marks on exposed surface.

.3 Install temporary furring and blocking as required to space-out and support Palisades.

.4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

.6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.7 Countersink bolts where necessary to provide clearance for other work.

.8 Comply with Section 01 36 29.06 - Health and Safety Requirements. This section includes special provisions for treated wood.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

3.5 PROTECTION (Cont'd)

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Reference Documents
.1 Ontario Provincial Standards (OPS) for Roads and Public Works, Ministry of Transportation (MTO), latest edition.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal when approved by Departmental Representative.

.3 Use control measures as specified in Section 01 35 43 - Environmental Procedures.

3.2 STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable Provincial and Federal requirements.

.2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.3 Handle topsoil only when it is dry and warm.

.4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal composting.

.5 Remove brush from targeted area by non-chemical means and dispose of through mulching.

.6 Strip topsoil to depths as directed by Departmental Representative.
.1 Avoid mixing topsoil with subsoil.

3.2 STRIPPING OF TOPSOIL (Cont'd)

.7 Pile topsoil in berms or stockpiles in locations as directed by Departmental Representative.
.1 Stockpile height not to exceed 2 m.

.8 Dispose of unused or surplus topsoil offsite.

.9 Protect stockpiles from contamination and compaction.

.10 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

3.3 PREPARATION OF GRADE

.1 Rough grade in accordance with requirements of Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Verify that grades are correct.
.1 Grade area only when soil is dry to lessen soil compaction.
.2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

.1 Place topsoil only after Departmental Representative has accepted subgrade.

.2 Place topsoil in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

.3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.

.4 Cultivate soil following spreading procedures.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11 - 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 SECTIONS

.1 Section 31 32 19.01 - Geotextiles.

1.2 REFERENCES

.1 Ontario Provincial Standard Specification (OPSS).
.1 OPSS.MUNI 1010, Material Specification for Aggregates - Base, Sub-base, Select Subgrade and Backfill Material (latest edition).

.2 American Society for Testing and Materials International (ASTM)
.1 ASTM C 117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
.2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
.3 ASTM D 422-63(2007)e1, Standard Test Method for Particle-Size Analysis of Soils.
.4 ASTM D 698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ^{3}) (600 kN-m/m ^{3}).
.5 ASTM D 4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.4 Reference Documents
.1 Ontario Provincial Standards (OPS) for Roads and Public Works, Ministry of Transportation (MTO), latest edition.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
.1 Rock: solid material in excess of 1.00 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95m^3 bucket. Frozen material not classified as rock.

1.3 DEFINITIONS (Cont'd)

.1 (Cont'd)

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan and frozen materials.

.2 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.6 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318-10, and gradation within limits specified when tested to ASTM D 422-63(2007) and ASTM C 136-06: Sieve sizes to CAN/CGSB-8.2-M88.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

1.3 DEFINITIONS (Cont'd)

.6 (Cont'd)
.2 (Cont'd)
.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.7 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 SUBMITTALS

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

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control.
.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this section.
.2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this section.
.3 Submit to Departmental Representative written notice when bottom of excavation is reached.
.4 Submit to Departmental Representative testing inspection results and report as described in PART 3 of this section.

.3 Preconstruction Submittals:
.1 Submit construction equipment list for major equipment to be used in this section prior to start of work.
.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field clearance record from utility authority location plan of relocated and abandoned services, as required.
.3 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and included product characteristics, performance criteria, physical size, finish and limitations.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

1.5 QUALITY ASSURANCE (Cont'd)

.2 For design of any temporary structures submit design and supporting data at least 2 weeks prior to beginning Work.

.3 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario, Canada in which work is to be carried out to design and inspect shoring, temporary access, bracing and underpinning required for Work.

.4 Contractor's Engineer shall make, check and sign all calculations; check, seal and sign all drawings; inspect temporary structures and systems; and verify their adequacy and safety.

.5 Keep design and supporting data on site.

1.6 EXISTING CONDITIONS

.1 Existing buried utilities and structures:
.1 Before commencing work obtain all required digging permits from local utilities, and verify and establish location of buried services on and adjacent to site.
.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
.5 Prior to beginning excavation Work, notify applicable owner or authorities to clearly mark such locations to prevent disturbance during Work.
.6 Confirm locations of buried utilities by hand digging or careful test excavations in presence of Departmental Representative. Hand dig all cables one metre either side of cable prior to machine excavation.
.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

1.6 EXISTING CONDITIONS (Cont'd)

.1 (Cont'd)

.8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or otherwise disturbing utilities or structures.

.9 Record location of maintained, re-routed and abandoned underground lines.

.2 Existing buildings and surface features:

.1 Conduct, with Departmental Representative, condition survey of existing buildings, fencing, service poles, wires, lighting fixtures, pavement, survey benchmarks and monuments, and all other surface features which may be affected by Work.

.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.3 Protect existing asphalt and concrete pavements which may be affected by Work from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.3 A geotechnical investigation has been completed. For subsurface information refer to Appendix B for Geotechnical Report.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Engineered Fill: Granular B - Type II OPSS.MUNI 1010.

.2 Select backfill material: from excavations or other sources, approved by the Departmental Representative for use intended, unfrozen and free from rocks larger than 80 mm, cinders, ashes, sods, organics, peat, refuse or other deleterious materials.

.3 Granular Base Course: Granular A, in accordance with OPSS.MUNI.1010.

.4 Geotextiles: to Section 31 32 19.01 - Geotextiles.

PART 3 - EXECUTION

3.1 SITE PREPARATION

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

3.2 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.
.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.3 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Submit for Departmental Representative's review details of proposed dewatering or heave prevention methods, including well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, existing facilities, or portion of Work completed or under construction.
.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.3 DEWATERING AND HEAVE PREVENTION (Cont'd)

.6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

.7 Control water from dewatering operations in accordance with OPSS 518.

3.4 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated.

.2 Excavation must not interfere with normal 45 degree spray of bearing capacity of adjacent foundations.

.3 Do not disturb soil within branch spread of trees or shrubs that are to remain.
.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.4 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than what can be completed in two (2) working days.

.5 Hoard excavations as required to present exposure to precipitation and/or freezing conditions. Frozen soil shall be replaced prior to backfilling at no cost to owner.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material at approved location off site. Comply with applicable provincial and municipal regulations.

.9 Do not obstruct flow of surface drainage or natural watercourses, expect where permitted.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

3.4 EXCAVATION (Cont'd)

.11 Notify Departmental Representative when bottom of excavation is reached and/or appears unsuitable and proceed as directed by Departmental Representative.

.12 Obtain Departmental Representative's approval of completed excavation.

.13 If encountered, remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
.1 Replace excavated material with compacted Engineered Fill compacted to no less than 98% Standard Proctor maximum dry density.

.14 Correct unauthorized over-excavation as follows:
.1 Fill under areas with Engineered Fill compacted to not less than 98% of Standard Proctor Maximum Dry Density.

.15 Hand trim, make firm and remove loose material and debris from excavations.
.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.5 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698.
.1 Adjacent Retaining Wall: Engineered Fill, placed in uniform layers not exceeding 300 mm compacted thickness up to grades indicated to allow for surface treatment. Compact to no less than 98% maximum dry density.

3.6 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:
.1 Departmental Representative has inspected and approved installations.
.2 Inspection, testing, approval, and recording location of underground utilities.

3.6 BACKFILLING (Cont'd)

.1 (Cont'd)

.3 Removal of shoring and bracing; backfilling of voids with satisfactory material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers. Compact each layer before placing succeeding layer.

3.7 GRADING

.1 Rough grade to levels, profiles and contours allowing for surface treatment as indicated.

.2 Grade ditches to depth as indicated.

3.8 RESTORATION

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil, seed or sod and fertilize as indicated.

.3 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.4 Repair all landscaping areas disbursed by excavation to thickness, structure and elevation which existed before start of construction.

.5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)
.1 ASTM A36/A36M Structural Steel.
.2 ASTM A123-02 Standard Specification for Zinc (Hot-Dip Galvanized Coatings on Iron and Steel Products).
.3 ASTM A153-05 Standard Specification for Zinc Coating (Hot dip) on Iron and Steel Hardware.
.4 ASTM A513-A513M-07 Standard Specification for General Requirements for Carbon and Low Alloy Steel Tubes.
.5 ASTM D1143/D1143M-07 Standard Test Method for Piles Under Static Axial Compressive Load.
.6 ASTM D3689 Standard Test Method for Individuals Piles Under Static Axial Tensile Load.
.7 ASTM D3966-07 Standard Test Method for Piles Under Lateral Loads.

.2 American Society of Mechanical Engineers (ASME)
.1 ANSI/ASME Standard B18.2.1-1996, Square and Hex Bolts and Screws Inch Series.

.3 Occupational Safety and Health administration (OSHA)
.1 Excavation Safety Guidelines.

.4 ICC-Evaluation Services Inc.
.1 AC358 Acceptable Criteria for Helical Foundation Systems and Devices.

.5 American Welding Society
.1 ANSI/AWS B2.1-00 Standard for Welding Procedure and Performance Qualification.

.6 SNC-Lavalin Inc. Geotechnical Investigation Report, dated November 6, 2017 (attached in Appendix B).

1.2 MEASUREMENT PROCEDURES

.1 Provide lump sum price to install each pile being driven for Pile Driving Analyzer and Wave Equation Analysis procedure.

1.3 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 Departmental Representative and await further instructions.

.4 Submit schedule of planned sequence of driving to Departmental 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 Province of Ontario, Canada.

.6 Equipment:
.1 Submit prior to pile installation for approval by Departmental Representative, list and details of equipment for use in installation of piles.

.7 Submit driveability analysis as specified to Departmental Representative for approval of hammers.

.8 Quality assurance submittals:
.1 Test reports: submit three (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.
.3 Pile Inspection Report: Submit report stamped by Provessinal Engineer registered in Ontario confirming that installed piles met the design and performance requirements as specified in contract documents.

1.3 SUBMITTALS (Cont'd)

.9 Qualifications:

.1 Evidence showing manufacture has at least ten (10) years experience in the design and manufacture of Helical Piles and Helical Anchors.

.2 Current ICC-ES product evaluation report or complete description of product testing and engineering calculations used to assess product capacity.

.3 Current ISO9001 certificate to manufacturing quality assurance program documentation showing methods used to assess and maintain product quality.

.10 Shop Drawings;

.1 Contractor shall prepare and submit to Departmental Representative for review and approval, Shop Drawings and specifications for the Helical Piles and Helical Anchors intended for use on the project at least 14 calendar days prior to planned start of installation. The Shop Drawings shall include the following:

.1 Helical Pile and Helical anchor product identification number(s) and designation(s).

.2 Maximum allowable mechanical compression and tensile strength of the Helical Piles and Helical Anchors.

.3 Number of Helical Piles and Helical Anchors and respective design allowable capacities from the Drawings.

.4 Planned installation depths and the number of lead and extension sections.

.5 Preliminary helical configurations (number and diameter of helical bearing plates).

.6 Manufacturer's recommend capacity to installation torque ratio.

.7 Minimum final installation torque(s).

.8 Product identification numbers and designations for all Bracket Assemblies and number and size of connection bolts or concrete reinforcing steel detail.

.9 Corrosion protection coating on Helical Piles, Helical Anchors and Bracket Assemblies.

1.3 SUBMITTALS (Cont'd)

.10 (Cont'd)

.2 Contractor's Pile Design Professional shall submit to Departmental Representative design calculations for the Helical Piles, Helical Anchors and Brackets intended for use on the project at least 14 calendar days prior to planned start of installation. The Shop Drawings shall include the following:

.1 Reductions in shaft dimension and strength by the sacrificial thickness anticipated based on corrosion loss over the design life for project soil conditions.

.2 Considerations for down drag, buckling, and expansive soils (as appropriate).

.3 Minimum installation depths to reach bearing stratum and to achieve pullout capacity (if required).

.4 Soil bearing and pullout capacity.

.5 Lateral resistance of the shaft (if required).

.6 Estimate pile head movement at design loads.

.3 Contractor shall submit to Departmental Representative calibration information certified by an independent testing agency for the torque measurement devise and all load testing and monitoring equipment to be used on the project. Calibration information shall be used on the project. Calibration information shall have been tested within the last year of the date submitted. Calibration information shall include, but is not limited to, the name of the testing agency, identification number or serial number of device calibrated, and the date of calibration.

.4 If load test or proof load tests are required on the Drawings, the Contractor shall submit for review and acceptance the proposed load testing procedure. The proposal shall provide the minimum following information:

.1 Type and sensitivity of load equipment.

.2 Type and sensitivity of load measuring equipment.

.3 Type and sensitivity of pile-head deflection equipment.

1.3 SUBMITTALS (Cont'd)

.10 (Cont'd)

.4 (Cont'd)

.4 General description of load reaction system, including description of reaction anchors or bearing plate.

.5 Calibration reports for equipment, including hydraulic jack, pressure gauges, and deflection dial gauges.

.5 Work shall not being until all the submittals have been received and approved by the Departmental Representative. The Contractor shall allow the Engineer a reasonable number of days to review, comment and return the submittal package after a complete set has been received. All costs associated with incomplete or unacceptable submittals shall be the responsibility of the Contractor.

.11 Warranty:

.1 Manufacturer shall provide a one year warranty against manufacturing defects on Helical Pile, Helical Anchor and Bracket products. Any additional warranty provided by the Contractor shall be issues as an addendum to this specification.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacture 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 Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

1.6 EXISTING CONDITIONS

.1 Refer to SNC-Lavalin Inc. Geotechnical Report,dated November 6, 2017 (attached in Appendix B).

1.6 EXISTING CONDITIONS (Cont'd)

.2 Notify Departmental Representative in writing if subsurface conditions at site differ from those indicated and await further instructions from Departmental Representative.

1.7 SCHEDULING

.1 Provide schedule of planned sequence of driving to Departmental Representative for review, not less than two weeks prior to commencement of pile driving.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Helical Piles:

.1 Pile Design Professional to select the appropriate size and type of Helical Piles to support the design loads shown on the drawings and connect to super structure. These specifications and the Drawings provide minimum requirements to aid the Contractor in making appropriate materials selections. The size and number of helical bearing plates must be such that the Helical Piles and Helical Anchors achieve the appropriate torques and capacity in the soils at the site within the minimum and maximum length requirements. Failure to achieve proper torque and torque and capacity in the soils at the site within the minimum and maximum length requirements. Failure to achieve proper torque and capacity shall result in Contractor replacing Helical Piles and Helical Anchors as appropriate to support the require loads. All material replacements shall be acceptable to Departmental Representative.

.2 The design strength of the helical bearing plates, shaft connections, brackets, and the pile shaft itself shall be sufficient to support the design loads specified on the Drawings multiplied by appropriate service load factors. In addition, all Helical Piles shall be manufactured to the following criteria:

2.1 MATERIALS (Cont'd)

.1 (Cont'd)

.2 (Cont'd)

.1 Central Shaft: The central shaft shall be minimum 114 mm outside diameter (I.D.0 high strength structural steel tube meeting the requirements of ASTM A513 Grade 65. The central shat shall have design wall thicknesses of minimum 9 mm.

.2 Helical Bearing Plates: One or more helical bearing plates shall be affixed to the central shaft. Helical bearing plates shall be minimum 305 mm in diameter required bearing area. Sized for shafts shall have a minimum thicknesses of 16 mm, respectively, and shall meet the requirements of ASTM A36. Helical bearing plates shall be connected to shafts complete with 8 mm minimum fillet welds, continuous on top and bottom and around the leading edges. Helical bearing plates shall be cold pressed into near perfect helical shape that when affixed to the central shaft are perpendicular with the central shaft, of uniform pitch, and such that the leading and railing edges are within 9.5 mm of parallel. Average helical pitch shall be within plus or minus 6.4 mm of the thickness of the helical bearing plate plus 76 mm.

.3 Corrosion protection: Helical Piles and Pile Caps shall be:

.1 Corrosion Protection: Helical Pipes and all associated hardware shall be hot-dip galvanized per CAN/CSA G164.

.2 Galv. Thickness: minimum 660g/m^2.

.4 Shaft connections: The Helical Pile and Helical Anchor shaft connections shall consist of an external sleeve connection or a welded connection. External sleeve connections shall be in-line, straight and rigid and shall have a maximum tolerable slack of 2 mm.

2.1 MATERIALS (Cont'd)

.1 (Cont'd)

.2 (Cont'd)

.5 Welded connections shall consist of a full penetration groove weld all-around the central shaft. Shaft connections shall have a flexural strength at least as great as the shaft itself.

.6 Bolts: External sleeve connections for shafts shall be made via minimum two bolts. Bolts shall be minimum 32 mm diameter as required for strength. Bolt holes through the external sleeve and central shaft shall have a diameter that is 2 mm greater than the bolt diameter. Bolts and nuts used to join Helical Pile and Helical Anchor sections at the shaft connections shall be zinc coated to match the corrosion protection used for the central shaft. Bolts shall be ASME SAE Grade 8 or ASME SAE Grade 5. All Helical Pile and Helical Anchor Bolts shall be securely snug tightened.

.7 Plug Welds: Alternatively, external sleeve connections may be made using plug welds matching the diameter and number of bolt holes.

.8 External sleeve: External sleeve Helical Pile and Helical Anchor shaft connections shall consist of minimum 8 mm thick wall, high strength structural steel tube outer sleeve meeting the requirements of ASTM A513 Grade 65. The outer sleeve shall be welded to the central shaft via a continuous fillet weld all-around. The fillet weld shall have a throat thickness equal to the external sleeve tube thickness.

.9 Reinforced connections: High strength structural steel tube inner sleeve meeting the requirements of ASTM A513 Grade 65. The inner sleeve shall be welded to the central shaft via plug welds oriented 90 degrees from and located slightly below the bolt holes.

2.2 INSTALLATION EQUIPMENT

.1 Torque Motor: Helical Piles and Helical Anchors shall be installed with high torque, low RPM torque motors, which allow the helical plates to advance with minimum soil disturbance. The torque motor shall be hydraulic power driven with clockwise and counter-clockwise rotation capability. The torque motor shall be adjustable with respect to revolutions per minute during installation. Percussion drilling equipment shall not be permitted. The torque motor shall have torque capacity equal to or greater than the minimum final installation torque required for the project. The connection between the torque motor and the installation rig shall have no more than two pivot hinges oriented 90 degrees from each other. Additional hinges adversely affect lateral capacity.

.2 Installation Equipment: The installation equipment shall be capable of applying adequate crowd and torque simultaneously to ensure normal advancement of the Helical Piles and Helical Anchors. The equipment shall be capable of maintaining proper alignment and position.

.3 Drive Tool: The connection between the torque motor and Helical Pile shall be in-line, straight, and rigid, and shall consist of a hexagonal, square, or round kelly bar adaptor and helical shaft socket. To ensure proper fit, the drive tool shall be manufactured by the Helical Pile manufacturer and used in accordance with the manufacturer's installation instructions.

.4 Connection Pins: The central shaft of the Helical Pile or Helical Anchor shall be attached to the drive tool by ASME SAE Grade 8 smooth tapered pins matching the number and diameter of the specified shaft connection bolts. The connection pins shall be maintained in good condition and safe to operate at all times. The pins shall be regularly inspected for wear and deformation. Pins shall be replaced with identical pins when worn or damaged.

2.2 INSTALLATION EQUIPMENT (Cont'd)

.5 Torque Indicator: A torque indicator shall be used to measure installation torque during installation. The torque indicator can be an integral part of the installation equipment or externally mounted in-line with the installation tooling. The torque indicator shall be capable of torque measurements with a sensitivity of 500 ft. lb or less. Torque indicators shall have been calibrated within 1 year Torqueo start of Work. indicators that are an integral part of the installation equipment shall be calibrated on-site. Torque indicators that are mounted in-line with the installation tooling shall be calibrated either on-site or at an appropriately equipped test facility. Indicators that measure torque as a function of hydraulic pressure shall be re-calibrated following any maintenance performed on the torque motor. Torque indicators shall be re-calibrated if, in the opinion of the Engineer, reasonable doubt exists as to the accuracy of the torque measurements.

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.

3.2 INSTALLATION PROCEDURES

.1 Unless shown on the Drawings, the number and size of helical blades shall be determined by the Contractor's Pile Design Professional in order to achieve the required torque and tensile/bearing capacity for the soil conditions at the site. The ratio of design load to the total area of the helical bearing plates shall not exceed the Allowable Bearing Capacity.

.2 Connect the lead section to the Torque Motor using the Drive Tool and Connection Pins. Position and align the Lead Section at the location and to the inclination shown on the Drawings and crowd the pilot point into the soil. Advance the Lead Section and continue to add Extension Sections to achieve the Termination Criteria. All sections shall be advanced into the soil in a smooth, continuous manner at a rate of rotation between 10 and 40 revolutions per minute. Snug tight all coupling bolts.

.3 Constant axial force (crowd) shall be applied while rotating Helical Piles and Helical Anchors into the ground. The crowd applied shall be sufficient to ensure that the Helical Pile and Helical Anchor advances into the ground a distance equal to at least 80% of the blade pitch per revolution during normal advancement.

.4 The torsional strength rating of the Helical Pile shall not be exceeded during installation.

.5 Bolt hole elongation due to torsion of the shaft of a Helical Anchor at the drive tool shall be limited to 6 mm. Helical Anchors with bolt hole damage exceeding this criterion shall be uninstalled, removed and discarded.

3.2 INSTALLATION PROCEDURES (Cont'd)

.6 When the Termination Criteria of a Helical Pile or Helical Anchor is obtained, the Contractor shall adjust the elevation of the top end of the shaft to the elevation shown on the Drawings or as required. This adjustment may consist of cutting off the top of the shaft and drilling new holes to facilitate installation of Brackets to the orientation shown on the Drawings. Alternatively, installation may continue until the final elevation and orientation of the pre-drilled bolt holes are in alignment. Contractor shall not reverse the direction of torque and back-out the Helical Pile or Helical Anchor to obtain the final elevation.

.1 The Contractor shall install Brackets in accordance with Helical Pile manufacturer's details or as shown on the Drawings.

.2 All Helical Pile and Helical Anchor components including the shaft and Bracket shall be isolated from making a direct electrical contact with any concrete reinforcing bars or other non-galvanized metal objects since these contact may alter corrosion rates.

.3 After installation, Helical Anchors shall be pre-tensioned if indicated on the Drawings.

3.3 TERMINATION CRITERIA

.1 Helical Piles and Helical Anchors shall be advanced until all of the following criteria are satisfied.

.1 Axial capacity is verified by achieving the final installation torque as provided by the Pile Design Professional. Helical Pile capacity in solid and on bedrock depends on the geometric configuration of the helical bearing plates and the subsurface conditions. The torque applied during installation provides a verification of axial capacity. A minimum factor of safety of 2.0 shall be used to determine allowable capacity. Hence, all Helical Piles and Helical Anchors shall be advanced until a final installation torque is achieved equal to the design loads shown on the Drawings times a factor of safety of 2.0 divided by the capacity to torque ratio (e.g. final installation torque = design loads, x 2.0/capacity to torque ratio).

3.3 TERMINATION CRITERIA (Cont'd)

.1 (Cont'd)

.2 Minimum depth is obtained. The minimum depth shall be as shown on the Drawings, that which corresponds to the planned bearing stratum, or the depth at which the final installation torque is measured, whichever is greater. In addition, Helical Anchors shall be advanced until the average torque over the last three(3) feet equals or exceeds the required final installation torque.

3.4 DRIVING TOLERANCES

.1 Pile heads to be within 25 mm of locations as indicated.

.2 Piles not to be more than 5% of length out of vertical alignment.

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 Departmental Representative.

3.6 REPAIR AND RESTORATION

.1 Pull out rejected piles and replace with new piles.

.2 Remove rejected pile and replace with new, and if necessary, longer pile.

.3 Remove rejected pile and fill hole as directed by Departmental Representative.

.4 Leave rejected pile in place and cut off as directed by Departmental Representative.

.5 Leave rejected pile in place, place adjacent pile and modify pile cap as directed by Departmental Representative.

.6 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 The Contractor shall provide to Departmental Representative copies of installation records within 48 hours after each installation is completed. These installation records shall include, but are not limited to, the following information:

.1 Name of project and Contractor.

.2 Name of Contractor's supervisor during installation.

.1 Date and time of installation.

.2 Name and model of installation equipment.

.3 Type of torque indicator used.

.4 Location of Helical Pile or Helical Anchor by grid location, diagram or assigned identification number.

.5 Type and configuration of Lead Section with length of shaft and number and size of helical bearing plates, if any.

.6 Type and configuration of Extension Sections with length and number and size of helical bearing plates, if any.

.7 Installation duration and observations.

.8 total length installed.

.9 Final elevation of top of shaft and cut-off length, if any.

.10 Final plumbness or inclination of shaft.

.11 Installation torque at minimum three-foot depth intervals.

.12 Final installation torque.

.13 Comments pertaining to interruptions, obstructions or other relevant information.

.14 Verified axial load capacity.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11 - 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 31 14 13 - Soil Stripping and Stockpiling.

.2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.3 Section 32 92 23 - Sodding.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada
.1 The Canadian System of Soil Classification (latest edition).

.2 Canadian Council of Ministers of the Environment
.1 PN1340-2005, Guidelines for Compost Quality.

.3 Canadian Nursery Landscape Association
.1 Canadian Standards for Nursery Stock (latest edition).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty 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.

1.5 WASTE MANAGEMENT AND DISPOSAL (Cont'd)

.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 TOPSOIL

.1 Stockpiled Topsoil from site: Employ use of stripped topsoil as approved by Departmental Representative. Supplement with imported topsoil as required.

.2 Topsoil: for seeded and sodded areas. 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 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
.4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:
.1 Fertility: major soil nutrients present in following amounts:
.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
.5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

2.2 SOIL AMENDMENTS (Cont'd)

.1 (Cont'd)
.6 Ph value: 6.5 to 8.0.

.2 Peatmoss:
.1 Derived from partially decomposed species of Sphagnum Mosses.
.2 Elastic and homogeneous, brown in colour.
.3 Free of wood and deleterious material which could prohibit growth.
.4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Limestone:
.1 Ground agricultural limestone.
.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

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

2.3 SOURCE QUALITY CONTROL

.1 Contractor is responsible for amendments to supply topsoil as required.

.2 Soil testing by recognized testing facility for PH, P, N and K, and organic matter.

.3 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

3.1 GENERAL

.1 Construct rough grade in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.2 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.
.1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
.2 Remove debris which protrudes more than 75 mm above surface.
.3 Dispose of removed material off site.

3.3 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Departmental Representative has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil as indicated to following minimum depths after settlement.
.1 135 mm for sodded areas.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.4 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.
.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
.1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.5 ACCEPTANCE

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

3.6 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required where directed by Departmental Representative off site.

3.7 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

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

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
.1 Schedule sod laying to coincide with preparation of soil surface.
.2 Schedule sod installation when frost is not present in ground.
.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

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 sod and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

.4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

1.4 QUALITY ASSURANCE

.1 Qualifications:
.1 Landscape Contractor: to be a Member in Good Standing of Ontario Horticultural Trades Association.
.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

1.4 QUALITY ASSURANCE (Cont'd)

.1 (Cont'd)
.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in accordance with supplier's recommendations.
.2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
.1 Turf Grass Nursery Sod types:
.1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% chewing Fescue or Creeping Red Fescue cultivars.
.2 Turf Grass Nursery Sod quality:
.1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square meters.
.2 Density of sod sufficient so that no soil is visible from height of 1500mm when mown to height of 50mm.
.3 Mowing height limit: 35 to 65mm.
.4 Soil portion of sod: 6 to 15mm.
.5 Broken, dry, discoloured pieces of sod will be rejected.

2.1 MATERIALS (Cont'd)

.1 (Cont'd)
.2 (Cont'd)
.2 Sod establishment support:
.1 Wooden pegs: 17 x 8 x 200 mm.

.3 Water:
.1 Free of impurities that would inhibit plant growth.

.4 Fertilizer:
.1 To Canada "Fertilizers Act" and Fertilizers Regulations.
.2 Complete, synthetic, slow release with 35% of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL

.1 Obtain written approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

PART 3 - EXECUTION

3.1 INSTALLERS

.1 Use installers who are Member in Good Standing of Ontario Horticultural Trades Association.

3.2 EXAMINATION

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

3.3 PREPARATION

.1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Fine grade surface free of humps and hollows to smooth, even grade, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod, and to allow surface to drain naturally.

.4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

3.4 SOD PLACEMENT

.1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.

.2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.4 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.5 FERTILIZING PROGRAM

.1 Fertilize during establishment and warranty periods to following program:
.1 Ratio for spring sodding: 1:2:2.
.2 Ratio for fall sodding: 1:4:4.
.3 Ratio for year one maintenance applications: May 3:0:0, July 3:1:3, September 1:2:3, or as recommended by an approved soils lab.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.
.1 Clean and reinstate areas affected by Work.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.
.1 Water sodded areas in sufficient quantities immediately after laying and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.
.3 Maintain sodded areas weed free 95%.
.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
.5 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.8 ACCEPTANCE

.1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
.1 Sodded areas are properly established.
.2 Sod is free of bare and dead spots.
.3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.8 ACCEPTANCE (Cont'd)

.3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Water sodded Turf Grass Nursery Sod. Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.

.3 Cut grass and remove clippings that will smother grass to height as follows:

.1 Turf Grass Nursery Sod:

.1 50 mm during normal growing conditions.

.2 Cut grass at 2 week intervals or as directed by Departmental Representative, but at intervals so that approximately one third of growth is removed in single cut.

.3 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

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

END OF SECTION

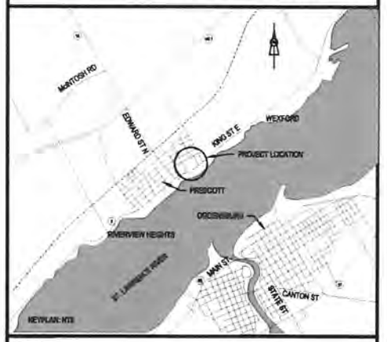
Appendix A

Location Plan and No-Go Zones

DIBBLE STREET
CONCRETE SIDEWALK
150mm WATER SERVICE
200mm SANITARY SEWER
OVERHEAD TRANSMISSION LINES
EDGE OF ASPHALT
GRAVEL ENTRANCE
ASPHALT SIDEWALK
3m± HIGH LOG DOUBLE PALISADE
LOG EPAULEMENTS
STONE APRON
BENCH MARK
OFFICERS QUARTERS
BLOCKHOUSE
LATRINE
WELL
VISITOR RECEPTION CENTRE
ASPHALT PARKING AREA
GRASS MEDIAN
CONCRETE CURB
DEPRESSED CURB
RUSSEL STREET
CONCRETE SIDEWALK
EDGE OF ASPHALT
CENTERLINE OF DITCH
TOP OF SLOPE
C.B.
RIM EL. 82.814
FORT WELLINGTON NATIONAL HISTORIC SITE OF CANADA
KING STREET EAST (COUNTY ROAD No 2)
construction corridor

Parks Canada
Georgian Bay and Eastern Ontario Field Unit

Parcs Canada
Baie-Georgienne et Unité de terrain de l'est de l'Ontario



NOTES:

1. ALL ELEVATIONS GIVEN AND NOTED ARE IN METERS. ALL SURVEY INFORMATION PROVIDED IS NOT REFERENCED TO A GEODETIC DATUM OR REFERENCED TO A SURVEY / CONTROL MONUMENT. ALL CO-ORDINATES SHOWN ARE APPROXIMATE IN NAD83, ZONE18 COORDINATE SYSTEM.

NOT FOR CONSTRUCTION

No.	Date	Description	Drawn by Dessiné par	Approved Approuvé
B02	2017 06/29	Issued For 99% Review		
B01	2017 04/25	Issued For 50% Review		

Revision / Revision

A/B Detail number / Sheet number — A Numéro de detail / B Numéro de la feuille

Linear dimensions in millimetres — Dimensions linéaires en millimètres

Consultant's Name / Nom de l'expert-conseil
SNC•LAVALIN
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Halifax, Nova Scotia, Canada
Member of the SNC•LAVALIN Group

Eng. Stamp / Sceau de l'ingénieur

Project title/Titre du projet
FORT WELLINGTON REHABILITATION

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EXISTING CONDITIONS

Designed by/Concept par: B.C.	Date: 2017/03/31
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Sheet No./Node la feuille

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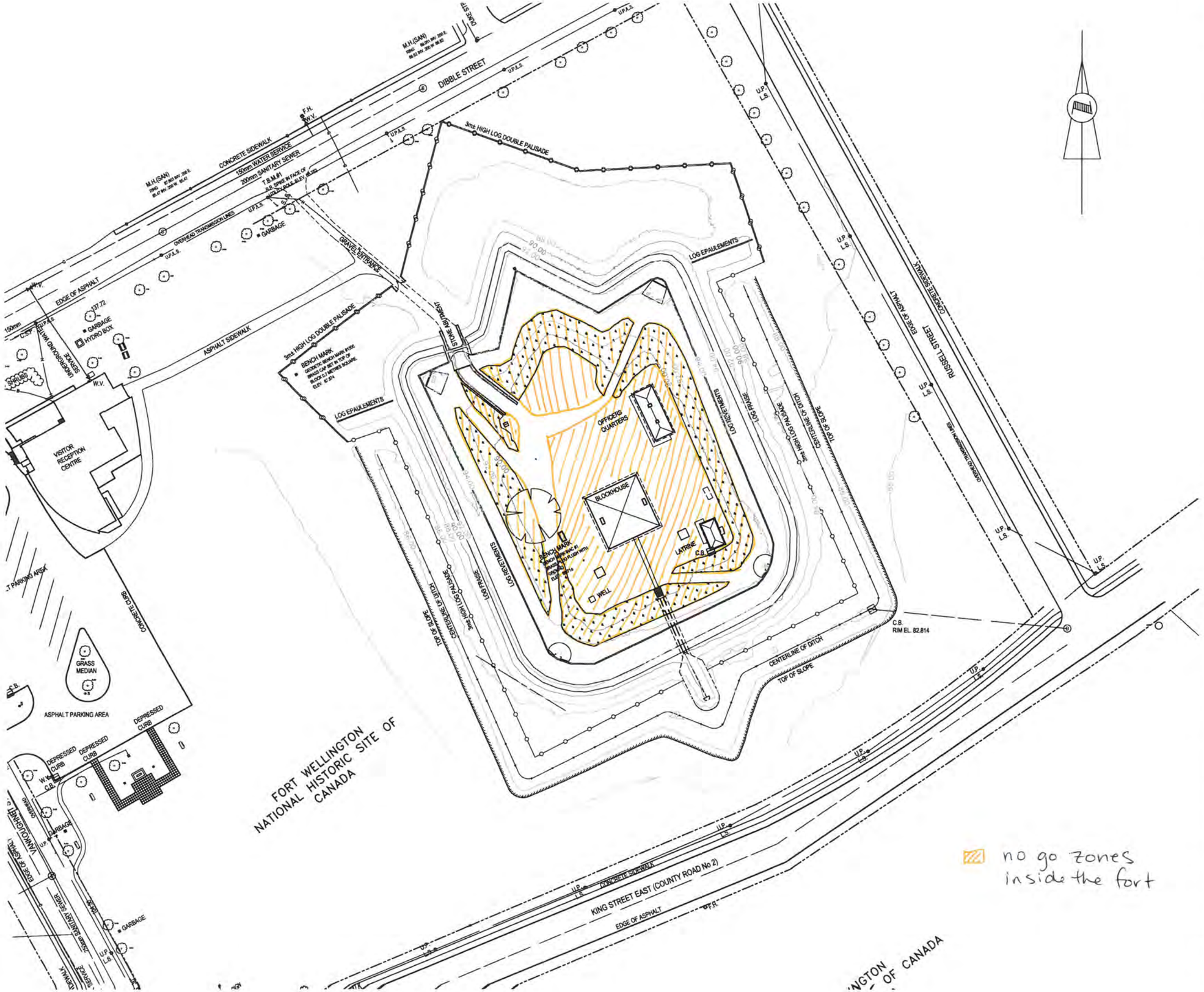
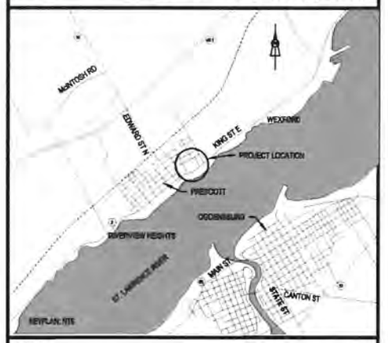


Parks Canada
Georgian Bay and Eastern Ontario Field Unit

Parcs Canada
Baie-Georgienne et Unité de terrain de l'est de l'Ontario



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B01	2017 04/25	Issued For 50% Review		

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Appendix B

Geotechnical Report

SNC·LAVALIN

Geotechnical Investigation
Fort Wellington Rehabilitation

370 Vankoughnet Street
Prescott, Ontario

PARKS CANADA

INFRASTRUCTURE

11 | 06 | 2017

FINAL REPORT > ORIGINAL

ref. 17-2150-23

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Geotechnical Investigation
Fort Wellington Rehabilitation

Final Report

Parks Canada, c/o
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NOTICE TO READER

This document contains the professional opinion *of SNC-Lavalin GEM Ontario Inc. (SNCL)* as to the matters set out herein, based on professional judgment and reasonable care. It is to be read in the context of the agreement (the "Agreement") between *SNCL* and Parks Canada (herein after referred to as the "Client"), the methodology, procedures and techniques used *SNCL*'s assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context.

SNCL has, in preparing the geotechnical parameters and recommendations, followed accepted methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgment and reasonable care, and is thus of the opinion that there is a high probability that actual site geotechnical conditions will fall within the predicted range. However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories and equipment suppliers, etc.) upon which *SNCL*'s opinions as set out herein are based, have not been verified by *SNCL*; *SNCL* makes no representation as to their accuracy and disclaims all liability with respect thereto.

SNCL disclaims any liability to third parties in respect of the publication, reference, quotation, or distribution of this report or any of its contents to and reliance thereon by any third party.

1 Introduction

SNC-Lavalin GEM Ontario Inc. (“SNCL”) was retained by Parks Canada (the “Client”) to conduct a geotechnical investigation in support of the rehabilitation of the palisade, revetment and fraising at Fort Wellington, located at 370 Vankoughnet Street in Prescott, Ontario (the “Site”). A view of the existing palisade and revetment are shown in Figure 1 below.

Figure 1 – West Palisade and Fraising, looking South (Sept-2017)

The purpose of this geotechnical investigation was to obtain information on the subsurface conditions at the Site by means of advancing a limited number of boreholes, in-situ tests and laboratory tests of selected soil samples. Based on SNCL’s interpretation of the obtained field information, recommendations are provided on the geotechnical aspects of the proposed development.

The field work for this investigation was carried out on August 28th, 2017 and consisted of drilling a total of six (6) boreholes on the Site. The boreholes were advanced under the full-time supervision of experienced geotechnical personnel from SNCL.

The work for this investigation was completed in accordance with SNCL’s approved proposal (Ref. No. 17-01645, dated July 21st, 2017).

This report contains the findings of SNCL’s geotechnical investigation, together with recommendations and comments. These recommendations and comments are based on factual information and are intended only for the use of the design engineers. The recommendations

and opinions in this report are applicable only to the proposed project as described in this Section. The Report Limitations are an integral part of this report.

Detailed environmental study and analysis to address such issues was beyond the scope of this geotechnical study. It is noteworthy that relevant environmental guidelines and regulations may have significant impact on project costs.

2 Method of Investigation

2.1 Fieldwork

A Site Location Plan (Drawing 1) and a Borehole Location Plan (Drawing 2) are presented in Appendix 1 of this report.

Six (6) boreholes identified as BH1 through BH6 were advanced around the exterior of the Site, in the vicinity of, and as close as was practical to the existing palisade – it should be noted that holes at the southernmost extents of the Site were located at the top of the ditching adjacent to the palisade, as illustrated in the borehole location plan. All boreholes were advanced to practical auger refusal with a truck mounted drill rig (CME-55), under the full-time supervision of experienced geotechnical personnel from SNCL. In addition, boreholes BH2 and BH3 were further advanced beyond auger refusal with 'N' sized diamond wireline coring equipment in order to confirm the presence of bedrock and comment on its type and quality.

Soil samples were taken while performing the Standard Penetration Test (SPT) in accordance with ASTM D1586. This consisted of freely dropping a 63.5 kg (140 lb.) hammer for a vertical distance of 0.76 m (30 inches) to drive a 51 mm (2 inch) outer diameter (O.D.) split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m (12 inches) was recorded as the SPT 'N' value of the soil which indicated the consistency of cohesive soils or the relative density of non-cohesive soils.

Upon completion of drilling, the soil samples were transported to our soil laboratory for further examination and laboratory testing.

Groundwater observations were made in the boreholes upon completion of drilling. It should be noted that there was not sufficient time available for the groundwater to stabilize inside the open boreholes.

In addition, SNCL was on Site in order to observe the conditions in three (3) test pits, which were advanced by others as a part of an archeological investigation, located at the top of the interior earthen berm in the vicinity of the revetment. The approximate locations of the test pits are also presented in Drawing 2.

2.2 Borehole Location and Elevation Surveying

Borehole locations and ground surface elevations were determined recorded with a Trimble R8 GNSS survey system by SNCL upon completion of the fieldwork. The coordinates and elevations are presented on borehole logs and are summarized in the following Table:

Table 1: Borehole Locations and Ground Surface Elevations

Borehole ID	Approximate Elevation (m AMSL)(1)	Borehole Easting (UTM Zone 18)	Borehole Northing (UTM Zone 18)
BH1	88.32	459663	4951277
BH2	88.84	459713	4951301
BH3	87.43	459645	4951226
BH4	88.68	459662	4951272
BH5	85.83	459715	4951128
BH6	86.35	459787	4951169

1) m AMSL: m above mean sea level

It should be noted that the above coordinates and elevations are provided to establish relative differences between borehole locations, and should not be used for construction purposes.

3 Subsoil Conditions

The soil descriptions given in this report and the borehole logs are based on current geotechnical practice, as per the Canadian Foundation Engineering Manual, 4th Edition. The various terms describing the soils are given at the beginning of Appendix 2.

Details of the subsurface conditions encountered are presented on the individual borehole logs attached to this report as Appendix 2. It is emphasized however, that the soil types, their sequence, thickness and physical properties may vary between test locations and samples both vertically and horizontally. The encountered subsoil conditions are summarized as follows:

3.1 Topsoil

A black clayey topsoil laden with rootlets was encountered at all borehole locations. The topsoil was found to be of the following thicknesses:

- 180 mm at BH1;
- 200 mm at BH2;
- 150 mm at BH3;
- 200 mm at BH4;
- 180 mm at BH5; and
- 200 mm at BH6.

It should be noted that in our experience, topsoil depths have been found to vary greatly between and beyond borehole locations, and also that topsoil can become compressed within the split barrel sampler. Topsoil thicknesses as presented in this report should not be used for detailed quantity takeoffs.

3.2 Silty Clay Fill

A brown silty clay fill with some gravel and trace sand was encountered at all borehole locations, in the following intervals of depth:

- BH1 from 0.18 to 0.9 m below ground surface (mbgs);
- BH2 from 0.2 to 0.6 mbgs;
- BH3 from 0.15 to 0.9 mbgs;
- BH4 from 0.2 to 1.07 mbgs;
- BH5 from 0.18 to 1.5 mbgs; and
- BH6 from 0.2 to 1.2 mbgs.

The presence of cobbles in the fill was also observed in borehole BH6.

The recovered samples of this the fill were visually described to be in a generally moist condition. The moisture content measurements obtained on the recovered samples of this material were found to be between 14 and 22% by weight.

The SPT 'N' values measured within this material were found to be between 4 and 13 blows per 300 mm of penetration, indicating a consistency ranging from firm to stiff. Refusal to sampler advancement was encountered at samples identified as BH6/SS1 and BH6/SS2 – traces of cobble fragments were noted within these samples.

3.3 Native Silty Sand

A brown native silty sand with some clay, some gravel, and possible cobbles and boulders was observed at all borehole locations, in the following intervals of depth:

- BH1 from 0.9 to 3.61 mbgs (end of borehole);
- BH2 from 0.6 to 4.42 mbgs;
- BH3 from 2.1 to 2.62 mbgs;
- BH4 from 1.07 to 5.03 mbgs (end of borehole);
- BH5 from 2.29 to 4.72 mbgs (end of borehole); and
- BH6 from 1.2 to 6.1 mbgs (end of borehole).

The recovered samples of this material were visually described to be in a very moist condition. The moisture content measurements obtained on the extracted samples of this material were found to be between 6 and 18% by weight.

The SPT 'N' values measured within this material were found to be between 13 and 37 blows per 300 mm of penetration, indicating a compact to dense relative density, with the exception of sample BH6/SS3, with an SPT 'N' value of 6, indicating a loose relative density. Refusal to the sampler was encountered within this material at samples identified as BH1/SS4, BH1/SS5, BH3/SS4, BH4/SS3, BH4/SS4, BH4/SS5, BH4/SS6, BH5/SS5, BH5/SS6, BH6/SS5 and BH6/SS6, possibly due to the presence of cobbles, boulders and/or rock slabs.

3.4 Native Silty Clay

A deposit of silty clay with trace sand was encountered in BH3 and BH5, at the following intervals of depth:

- BH3 from 0.9 to 2.1 mbgs; and
- BH5 from 1.5 to 2.3 mbgs.

The recovered samples from this material were visually described as very moist. The moisture content measurements obtained on the extracted samples of this material were found to be between 24 and 27%.

Standard Penetration tests yielded 'N' values of between 9 and 22 blows per 300 mm of penetration, indicating a stiff consistency in BH3 and a very stiff consistency in BH5.

3.5 Limestone Bedrock

Upon encountering auger refusal in BH2 and BH3, at depths of 5.18 and 2.62 mbgs, respectively, rock coring was initiated to verify bedrock conditions. The coring was carried out

using 'N' sized double tube wireline equipment, facilitating recovery of 47.6 mm diameter cores. The coring was advanced to a depth of 5.94 mbgs at BH2 and 4.14 mbgs at BH3, with a total lengths cored of 0.76 and 1.52 m at BH2 and BH3, respectively. A summary of the obtained information is presented in the following table and the core drilling information and material descriptions are reported on the respective borehole logs.

Table 2: Bedrock Core Information

Borehole/Core Run ID	Elevation/Depth of Borehole (m AMSL/mbgs)	Elevation/Depth to Bedrock Surface (m AMSL/mbgs)	Total Core Recovery (%)	Solid Core Recovery (%)	RQD (%)
BH2/RC1	82.90 / 5.94	83.66 / 5.18	80	60	40
BH3/RC1	83.29 / 4.14	84.81 / 2.62	100	97	92

The samples were visually described by the field supervisor and subsequently re-examined in the laboratory. Photo logs of the obtained cores are presented in Appendix 3 of this report.

Detailed descriptions of the index properties at the location of this borehole are presented in the following paragraphs.

Total Core Recovery (TCR) of the obtained rock core was found to be between 80 and 100%.

Solid Core Recovery (SCR) was found to be between 60 and 97%. The SCR index is generally influenced by the orientations of the joints and is low when joints oblique to the borehole axis are intercepted.

Rock Quality Designation (RQD) index is highly dependent on the frequency of joints and bedding plane partings in the rock cores. While the use of double tube core barrel provided reasonably good protection of the core during drilling and core retrieval, the nature of the encountered material greatly influences the RQD values. On the basis of the recorded RQD values of between 40 in BH and 92% in BH3, the rock quality is estimated to be range between poor and excellent quality – it is estimated that overall, quality is likely generally good to excellent with localized highly weathered zones.

3.6 Test Pits (by others)

SNCL was on Site to observe several test pits which were excavated by others as a part of an archeological investigation, along the top of the interior berm. As shown in Figure 2 below, fill materials within the berm appeared to consist of a relatively uniform sandy fill overlying a silty clayey sand fill with cobbles (likely re-worked glacial till) and also some debris (see red line in Figure 2, approximately delineating these zones).

Figure 2 - Test pit on interior berm, excavated by others

The depth of the more uniform sandy fill material may correspond with previous repairs to the revetment.

3.7 Ground Penetrating Radar Survey

A ground penetrating radar survey was carried out around the exterior of the Site, around the edge of the palisade, and also along the top of the interior berm. The full report by the geophysics subcontractor, Geophysics GPR International Ltd., can be found attached in Appendix 5 of this report. As mentioned in the report, results around the exterior were found to be inconclusive, with the exception of the one contact shown in the report. The results on the interior appeared to indicate presence of some erosion control mesh placed within the berm. Also, upon discussion with Geophysics GPR International Ltd., the zone between 2 and 3 m where signal changes may delineate contact between newer and older material within the berm, as described in section 3.5 above.

4 Laboratory Testing

4.1 Geotechnical Laboratory Testing

All recovered samples were transported back to SNCL's laboratory located in Kingston, Ontario. Visual soil classifications made in the field were verified by peer review in the lab. Moisture content determinations were completed on all recovered samples, with the exception of BH5 location.

Grain size analysis and testing was performed on two (2) samples identified as BH2/SS3, and BH2/SS5. The results of these tests are presented in the following tables, and are also presented in Appendix 3 of this report.

Table 3: Summary of Gradation Testing Results

Sample ID	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH2/SS3	12	49	26	13
BH2/SS5	11	50	28	11

5 Groundwater Conditions

Groundwater observations were made in the boreholes as drilling proceeded and upon completion of drilling (prior to coring in BH2 and BH3). It should be noted that there was not sufficient time available for the groundwater to stabilize inside the open boreholes.

Table 4: Water Level Observations

Borehole ID	Water Level Observed in Open Borehole Upon Completion (mbgs / m AMSL)
BH1	2.7 / 85.62
BH2	3.0 / 85.84
BH3	Dry
BH4	Dry
BH5	Dry
BH6	Dry

*N/A - no piezometer installed

Groundwater should be expected to fluctuate seasonally and can be expected to be somewhat higher in response to major weather events. No long-term groundwater monitoring provisions were made in this investigation program.

6 Discussion and Recommendations

Based on the drawings provided by SNC-Lavalin, we understand the currently proposed foundation support for reconstructed palisade consists of the advancement of 'screw piles' (i.e. helical piers) into a pre-drilled hole filled with lean concrete mix at 'anchor post' locations, with several intermediate posts being supported on the anchor posts in between each. The proposed reconstruction of the revetment consists of placement of pre-cast retaining wall units on a granular pad, which would rest on the existing fill at the top of the interior berm and the proposed reconstructed fraising consists of pre-place concrete blocks placed on a granular pad, also resting on the existing fill on the top of the interior berm.

Helical piers could support the palisade redevelopment (see Figure 3 below). Helical piers are a factory-manufactured steel foundation system, consisting of a central shaft with one or more helix-shaped bearing plates and a bracket that allows attachment to a structure. The helix plates are commonly referred to as blades or flights and are welded to the lead section. Extension shafts, with or without additional helix plates, are used to extend the pier to competent load bearing soil and achieve design capacities. The capacity of the pile is confirmed using empirical relationships based on the measured installation torque. Due to the specialized and often proprietary nature of helical pier systems, specialist contractors would have to be consulted in order to provide approximate axial and uplift capacities as well as horizontal load resistances within the prevailing subsurface conditions.

Based on the results of the field investigation, depending on the elevations, there may be sufficient overburden present in order to develop a suitable amount of torque to terminate the helical piers – however, it should be noted that a number of refusals to the sampler were encountered within the overburden, inferring presence of cobbles and/or boulders, which could be an impediment to advancing this type of foundation system. Appropriate equipment for the conditions must be selected by the specialist contractor if this foundation type is utilized for this aspect of the redevelopment. Advancement of micropiles which extend into the bedrock may present an easier option for installation, however would be expected to carry a higher cost.

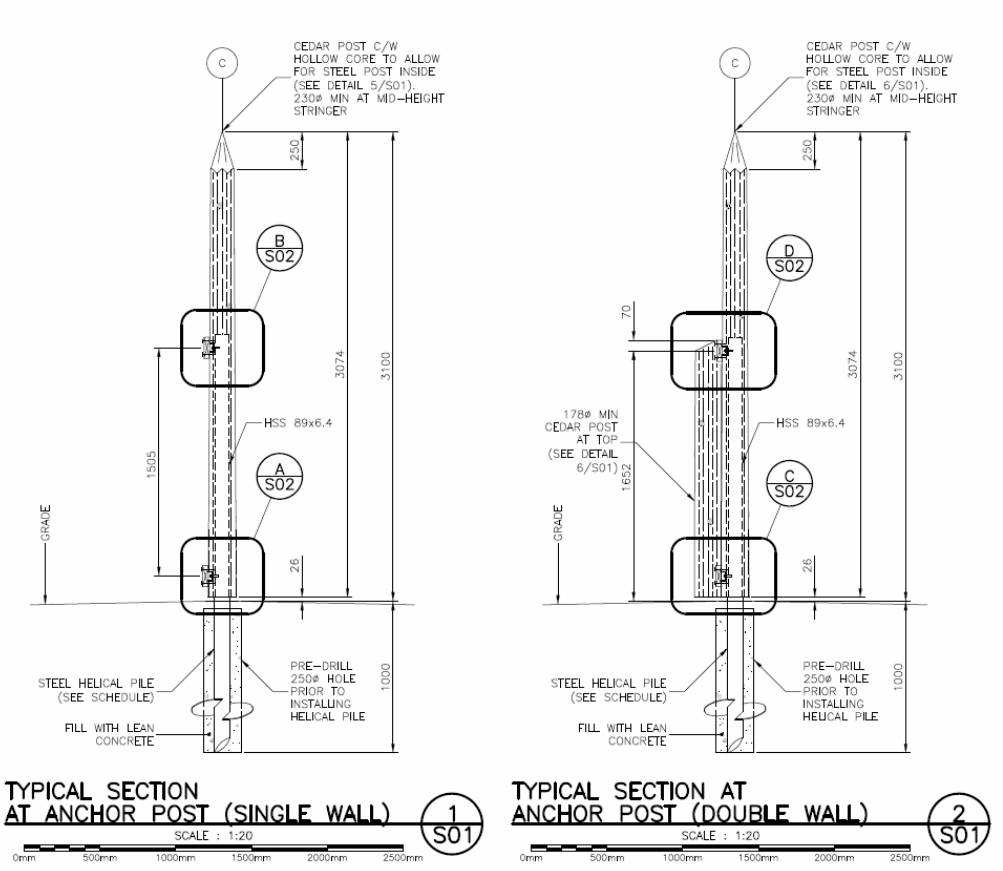


Figure 3 - Palisade anchor post typical detail, as provided

For the revetment and fraising (see Figure 4 below), while they are generally light and non-loaded structures, we would recommend that a foundation system extending to either native soils or bedrock underlying the interior berm be utilized to ensure that settlements do not occur. However, as we understand construction of such a foundation would be cost prohibitive and possibly disruptive to existing artifacts, with the current details of placement of these new structures on the existing fill, we would recommend that the more suspected recently placed granular materials be entirely removed from the footprint underneath the blocks at the revetment and the pre-cast structure at the fraising, and the underlying reworked glacial till fill be re-compacted to the extent possible, prior to the placement of new granular materials. Some settlements over the long term should still be expected, given the nature of the existing fill. Also, it is possible that some consolidation settlement of the fill soils within the interior berm could still be ongoing under its own weight. Based on hand held penetrometer readings of the underlying reworked till soil in the test pits during the archeological investigation, it is expected that this material could provide a bearing resistance at Ultimate Limit States in excess of 75 kPa. If structures are placed on this material however, as mentioned above, the magnitude of ongoing settlements would be unknown.

It should also be pointed out that there may be some creep-like instability of the berm which may be ongoing, as evidenced by the leaning of the palisade and movement of the fraising on

the west side (see Figure 1). However, investigation as to the stability of the berms was not within the terms of reference of this investigation.

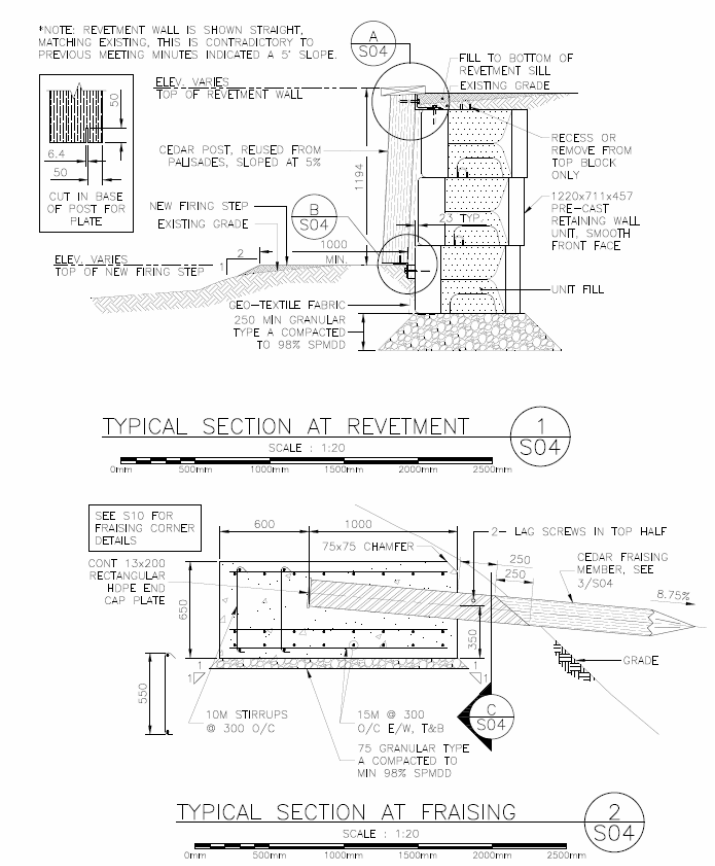


Figure 4 - Revetment and fraising typical details, as provided

6.1 Excavation

All excavations must be carried out in accordance with the OHSA regulations for Construction Projects, which states that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced. While open trench excavations deeper than 1.2 m are not expected at this Site, some temporary bracing and side slopes will be required for the fraising and revetment.

OHSA specifies maximum slopes of excavations for four broad soil types as summarized in the following table:

Table 5: Maximum Slope of Excavation for Soil Type

Soil Type	Base of Slope	Maximum Slope Inclination
Type 1	Within 1.2 metre of bottom of trench	1 horizontal to 1 vertical
Type 2	Within 1.2 metre of bottom of trench	1 horizontal to 1 vertical
Type 3	From bottom of excavation	1 horizontal to 1 vertical
Type 4	From bottom of excavation	3 horizontal to 1 vertical

The fill soils at this Site could be considered as Type 3 to Type 4, while native soils can be considered as Type 2 to Type 3 soils. However, any soils affected by groundwater seepage must be considered as Type 4 soils. The highest number soil type identified in an excavation must govern the excavation slopes from top to bottom of the excavation. Therefore, if fill soils or other soils affected by groundwater seepage is encountered in an excavation, the maximum slope inclination should be 3 horizontal to 1 vertical, otherwise the maximum slope inclination should be 1 horizontal to 1 vertical. A trench box may be used to reduce the required width of excavation.

For all cut slopes, the stability of the cut slopes will have to be frequently monitored by the geotechnical engineer. If the cut slopes are subject to erosion (e.g., due to rainfall, high groundwater flow, etc.), slope stabilization measures (e.g., covering the slope/trench faces with plastic sheets, excavating flatter slope, etc.) will have to be implemented.

Stockpiles of excavated materials should be kept at least 3 m from the edge of the excavation to prevent slope instability, subject to confirmation by the geotechnical engineer. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

6.2 Dewatering

Groundwater should not be expected to be a concern for installation of new posts, provided a helical pier or similar system is utilized. Contractors should be prepared to control inflow of perched water within the fill materials on the top of the berm, and should slope grades away from any open excavations during construction. If construction is undertaken during wet seasonal periods, static groundwater levels should be expected to be higher than those observed at the time of the investigation.

6.3 Frost Protection

A minimum earth cover of 1.6 m or an equivalent in thermal insulation in order to protect the foundations from detrimental frost action in the Prescott area. Zero support should be considered within this zone for any piers installed (helices should not be terminated within this zone, i.e. the bearing plates of helices should be screwed deeper than 1600 mm.). An insulation detail may be required to be incorporated into the revetment and fraising details.

6.4 Engineered Fill

Engineered Fill application may be required on this project in order to raise subgrade elevations, and during backfilling under new works.

For any fill operation to be considered Engineered Fill, the following criteria must be satisfied:

- Engineered Fill should consist of a uniform, homogeneous material. The fill material should also be free of organics, deleterious materials (i.e. building debris such as bricks, metal etc.). Materials meeting Ontario Provincial Standard Specifications (OPSS) Granular 'A', Granular 'B' Type I or II specifications would be considered as a suitable Engineered Fill material;
- Prior to the placement of Engineered Fill, it must be evaluated for suitability in the Geotechnical Laboratory. Samples should be provided to the Geotechnical Engineer and submitted for Standard Proctor and grain size analysis;
- Engineered Fill must be compactable, and of a suitable moisture content such that it is within +/- 2.0% of its optimum moisture content, as determined through laboratory testing;
- Engineered Fill must be placed under the continuous supervision of a Geotechnical Engineer or their designate;
- Each layer of material should be placed in maximum 0.2 m lifts, and uniformly compacted with heavy compaction equipment suitable for the type of fill used, to 100% of the material's Standard Proctor Maximum Dry Density (SPMDD);
- Field density tests must be taken on each lift of Engineered Fill. Any Engineered Fill which is tested and found to be out of specification shall either be removed, reworked or retested.

7 Closure

The recommendations provided in this report are based on subsoil data obtained at the sounding locations. Experience indicates that the subsoil and groundwater conditions can vary significantly between and beyond the sounding locations. For this reason, the recommendations given in this report are subject to a field verification of the subsoil conditions at the time of construction.

Should any site condition encountered differ from those at the tested locations or any changes in the project, we request that SNCL be notified immediately in order to permit reassessment of the recommendations.

8 General Conditions and Limitations

A. Use of the Report

A.1 The work performed in this report was carried out in accordance with the terms and conditions made part of our proposal and/or contract pursuant to which the report was issued. The conclusions presented in the report are based solely upon the scope of services, governed by the time and budgetary considerations to which this work is subject.

A.2 The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation or if the project is not initiated within twelve months of the date of the report, SNC should be given an opportunity to confirm that the recommendations are still valid.

A.3 The comments given in this report are intended only for the guidance of the design engineer. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual test hole data, as to how subsurface conditions may affect their work.

A.4 The reader should be advised that geotechnical opinions, presented in this report, are subject to inherent uncertainties due to sampling limitations.

A.5 The report must be read as a whole, as sections taken out of context may be misleading. Drafts and working copies of study reports and other deliverables, whether or not marked "draft" and/or "for discussion purposes", do not necessarily reflect SNCL's final opinion following consideration of all matters which are the subject of the study giving rise thereto; they are issued for comment and information purposes only, and are subject to change. The reader should not rely on such documents for any purpose.

B. Follow-up

B.1 All details of the design and proposed construction may not be known at the time of submission of *SNCL*'s report. It is recommended that *SNCL* be retained during the final design stage to review the design drawings and specifications related to foundations, earthworks, retaining systems and drainage, to determine that they are consistent with the intent of *SNCL*'s report.

B.2 Retention of *SNC* during construction is recommended to confirm and document that the subsurface conditions throughout the site do not materially differ from those given in *SNCL*'s report and to confirm and document that construction activities did not adversely affect the design intent of *SNCL*'s recommendations.

C. Soil and Rock Conditions

C.1 Soils and/or rock descriptions in this report are based on commonly accepted methods of classification and identification employed in professional geotechnical practice. Classification and identification of soil and rock involves judgment and

SNCL does not guarantee descriptions as exact, but infers accuracy only to the extent that is common in current geotechnical practice.

C.2 The soils and rock conditions described in this report are those observed at the time of the study. Unless otherwise noted, those conditions form the basis of the recommendations in the report. The condition of the soil and rock may be significantly altered by construction activities (traffic, excavation, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting or drying. Unless otherwise indicated the soil and rock must be protected from these changes or disturbances during construction.

D. Logs of Test Holes and Subsurface Interpretations

D.1 The test hole logs indicate the approximate subsurface stratigraphy and conditions only at the locations of the test holes. Soil and rock formations are variable to a greater or lesser extent. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface stratigraphy and conditions are indicated depends on the method of boring, the frequency of sampling, the method of sampling and the uniformity of subsurface stratigraphy and conditions.

D.2 Subsurface stratigraphy and conditions between test holes are inferred and may vary significantly from stratigraphy and conditions encountered at the test holes.

D.3 Groundwater elevations and conditions described in this report refer only to those observed at the place and time of observation noted in the report. These elevations and conditions may vary seasonally or as a consequence of construction activities on the site or adjacent sites.

E. Changed Conditions

E.1 Where conditions encountered at the site differ significantly from those described or anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the use or reliance by the client on this report that *SNCL* is notified of the changes and provided with an opportunity to review the recommendations of this report. Recognition of changed soil and rock conditions requires experience and it is recommended that an experienced geotechnical engineer be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

F. Drainage

F.1 Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage can have serious consequences. *SNCL* can take no responsibility for the effects of drainage unless *SNCL* is specifically involved in the detailed design and follow-up site services during construction of the system.

END OF DOCUMENT

Appendix 1

Borehole Location Plan and Site Location Plan

LEGEND

- Approximate Site Location

NOTES

1. All site features are approximate.

2. Drawing should be viewed in conjunction with report ref. 17-2842-01.

NO.	DESCRIPTION	DATE

SNC·LAVALIN

CLIENT: Parks Canada

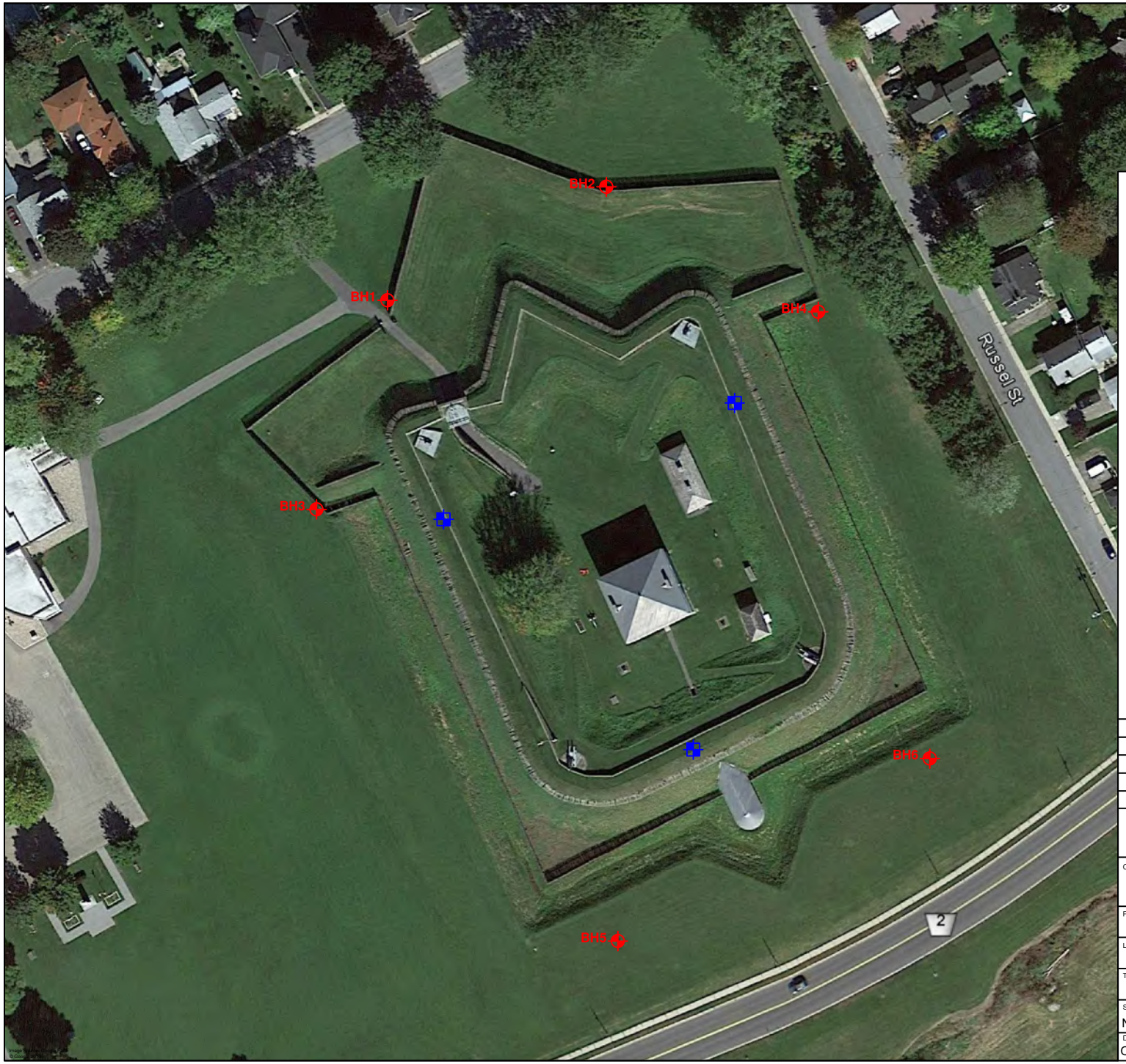
PROJECT: Fort Wellington Rehabilitation

LOCATION: 370 Vankoughnet Street, Prescott, ON

TITLE: Site Location Plan

SCALE: NTS

DATE:	FILE:	DIV.	DRAWING:
October 2017	17-2150-23	00	1



N

LEGEND

BH1 - Approximate borehole location

- Approximate test pit location (by others)

NOTES

1. All site features are approximate.

2. Drawing should be viewed in conjunction with report ref. 17-2150-23.

NO.	DESCRIPTION	DATE

SNC·LAVALIN

CLIENT: Parks Canada

PROJECT: Fort Wellington Rehabilitation

LOCATION: 370 Vankoughnet Street, Prescott, ON

TITLE: Borehole Location Plan

SCALE: NTS

DATE:	FILE:	DIV.	DRAWING:
October 2017	17-2150-23	00	2

Appendix 2

Record of Boreholes

RECORD OF BOREHOLE No. BH1

Project Number:	17-2150-23	Drilling Location:	Proposed palisade repair	Logged by:	MM
Project Client:	Parks Canada	Drilling Method:	100 mm Solid Stem Augers	Compiled by:	MM
Project Name:	Fort Wellington Rehabilitation	Drilling Machine:	Truck Mounted CME-55	Reviewed by:	DH
Project Location:	370 Vankoughnet Street, Prescott, ON	Date Started:	Aug 28, 17	Date Completed: Aug 28, 17	Revision No.:

Local Ground Surface Elevation: 88.32 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT ○ / DCPT ●); MTO Vane* (Intact △ / Remould ▲); Nilcon Vane* (Intact ◇ / Remould ◆); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L; Plastic / Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black topsoil - silty clay laden with rootlets 88.14 0.18										
	brown fill - silty clay, some gravel, trace sand firm moist	SS	1	51	5		88	○	18		
	87.42										
	brown 0.90 **SILTY SAND**- trace clay, trace gravel, suspected cobbles and boulders compact to very dense moist	SS	2	95	13	1	87	○	26		
		SS	3	59	17	2		○	12		
		SS	4	0	R		86				
						3					
		SS	5	52	R		85		11		
	84.71										
	end of borehole upon practical auger refusal 3.61										

Note:
1. Coordinates: N 4951277 E 459663
2. R denotes refusal to sampler.

▽ Groundwater depth on completion of drilling: 2.7 m.

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Scale: 1 : 42

RECORD OF BOREHOLE No. BH2

Project Number:	**17-2150-23**	Drilling Location:	**Proposed palisade repair**	Logged by:	**MM**
Project Client:	**Parks Canada**	Drilling Method:	**100 mm Solid Stem Augers**	Compiled by:	**MM**
Project Name:	**Fort Wellington Rehabilitation**	Drilling Machine:	**Truck Mounted CME-55**	Reviewed by:	**DH**
Project Location:	**370 Vankoughnet Street, Prescott, ON**	Date Started:	**Aug 28, 17** Date Completed: **Aug 28, 17**	Revision No.:	

Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 88.84 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black topsoil - silty clay laden with rootlets 88.64										
	brown 0.20 fill - silty clay, some gravel, trace sand firm moist 88.24	SS	1	75	5			○	8		
	brown 0.60 **SILTY SAND**- trace clay, trace gravel compact to very dense moist	SS	2	92	15	1	88	○	23		
		SS	3	100	32	2	87	○	11		
		SS	4	100	28			○	8		
		SS	5	92	37	3 ▽	86	○	9		
	84.42					4	85				
	grey/pink 4.42 **COBBLES AND BOULDERS**- suspected granitic cobbles and boulders	SS	6	33	R				8		
	83.66					5	84				
	grey 5.18 **LIMESTONE**- poor quality, few shaley partings	RC	1	80							SCR - 60% RQD - 40%
	82.90						83				
	end of borehole in limestone bedrock 5.94 Note: 1. Coordinates: N 4951301 E 459713 2. G, SA, SI, CL, and R denotes gravel, sand, silt, clay, and refusal, respectively.										

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▽ Groundwater depth on completion of drilling: 3 m.

Scale: 1 : 42

RECORD OF BOREHOLE No. BH3

Project Number:	17-2150-23	Drilling Location:	Proposed palisade repair	Logged by:	MM
Project Client:	Parks Canada	Drilling Method:	100 mm Solid Stem Augers	Compiled by:	MM
Project Name:	Fort Wellington Rehabilitation	Drilling Machine:	Truck Mounted CME-55	Reviewed by:	DH
Project Location:	370 Vankoughnet Street, Prescott, ON	Date Started:	Aug 28, 17	Date Completed: Aug 28, 17	Revision No.:

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 87.43 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black topsoil - silty clay laden with rootlets 87.28 0.15										
	brown fill - silty clay, some gravel, trace sand firm moist	SS	1	51	4		87	○	14		
	86.53										
	brown 0.90 **SILTY CLAY**- trace sand stiff very moist	SS	2	75	9	1		○	4		
							86				
		SS	3	84	12			○	29		
	85.33					2					
	brown 2.10 **SILTY SAND**- trace clay, trace gravel compact moist										
		SS	4	39	R		85		9		
	84.81										
	grey 2.62 **LIMESTONE**- good quality, few shaley partings					3					
		RC	1	100			84				SCR - 97% RQD - 92%
	83.29					4					
	end of borehole in limestone bedrock 4.14										

Note:
1. Coordinates: N 4951226 E 459645
2. R denotes refusal to sampler.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH4

Project Number:	**17-2150-23**	Drilling Location:	**Proposed palisade repair**	Logged by:	**MM**
Project Client:	**Parks Canada**	Drilling Method:	**100 mm Solid Stem Augers**	Compiled by:	**MM**
Project Name:	**Fort Wellington Rehabilitation**	Drilling Machine:	**Truck Mounted CME-55**	Reviewed by:	**DH**
Project Location:	**370 Vankoughnet Street, Prescott, ON**	Date Started:	**Aug 28, 17** Date Completed: **Aug 28, 17**	Revision No.:	

Local Ground Surface Elevation: 88.68 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black topsoil - silty clay laden with rootlets 88.48										
	brown 0.20 fill - silty clay, some gravel, trace sand firm to stiff moist	SS	1	67	5			○	13		
	87.61	SS	2	67	9	1	88	○	7		
	brown 1.07 **SILTY SAND**- trace clay, trace gravel, suspected cobbles and boulders compact to very dense moist	SS	3	100	R		87		33		
		SS	4	72	R	2			6		
		SS	5	81	R	3	86		7		
		SS	6	58	R	4	85		8		
	83.65					5	84				
	end of borehole upon practical auger refusal 5.03										

Note:
1. Coordinates: N 4951272 E 459662
2. R denotes refusal to sampler.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH5

Project Number:	17-2150-23	Drilling Location:	Proposed palisade repair	Logged by:	MM
Project Client:	Parks Canada	Drilling Method:	100 mm Solid Stem Augers	Compiled by:	MM
Project Name:	Fort Wellington Rehabilitation	Drilling Machine:	Truck Mounted CME-55	Reviewed by:	DH
Project Location:	370 Vankoughnet Street, Prescott, ON	Date Started:	Aug 28, 17	Date Completed: Aug 28, 17	Revision No.:

Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 85.83 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	black topsoil - silty clay laden with rootlets 85.65 0.18							PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80		
	brown fill - silty clay, some gravel, trace sand firm to stiff moist	SS	1	75	7			○			
		SS	2	87	13	1	85	○			
	84.33 brown 1.50 **SILTY CLAY**- trace sand very stiff very moist	SS	3	92	22	2	84	○			
	83.54 brown 2.29 **SILTY SAND**- trace clay, trace gravel, suspected cobbles and boulders compact to very dense moist	SS	4	41	R	3	83				
		SS	5	0	R	4	82				
	81.11 end of borehole upon practical auger refusal 4.72 Note: 1. Coordinates: N 4951128 E 459715 2. G, SA, SI, CL, and R denotes gravel, sand, silt, clay, and refusal, respectively.	SS	6	0	R						

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH6

Project Number:	17-2150-23	Drilling Location:	Proposed palisade repair	Logged by:	MM
Project Client:	Parks Canada	Drilling Method:	100 mm Solid Stem Augers	Compiled by:	MM
Project Name:	Fort Wellington Rehabilitation	Drilling Machine:	Truck Mounted CME-55	Reviewed by:	DH
Project Location:	370 Vankoughnet Street, Prescott, ON	Date Started:	Aug 28, 17	Date Completed: Aug 28, 17	Revision No.:

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 86.35 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: SPT ○ DCPT ●; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL); W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black topsoil - silty clay laden with rootlets 86.15	SS	1	81	R	0	86	○ 11			
	brown 0.20 fill - silty clay, some gravel, trace sand, trace cobble fragments firm moist										
		SS	2	0	R	1					
	85.15						85				
	brown 1.20 **SILTY SAND**- trace clay, trace gravel, possible cobbles and boulders loose to very dense moist	SS	3	54	6	2		○	○ 19		
		SS	4	84	23		84	○	○ 13		
		SS	5	0	R	3					
							83				
						4					
		SS	6	100	R		82		○ 13		
						5					
	80.25						81				
	end of borehole upon practical auger refusal 6.10					6					

Note:
1. Coordinates: N 4951169 E 459787
2. R denotes refusal to sampler.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Appendix 3

Bedrock Core Photos

Figure 1 – BH2/RC1

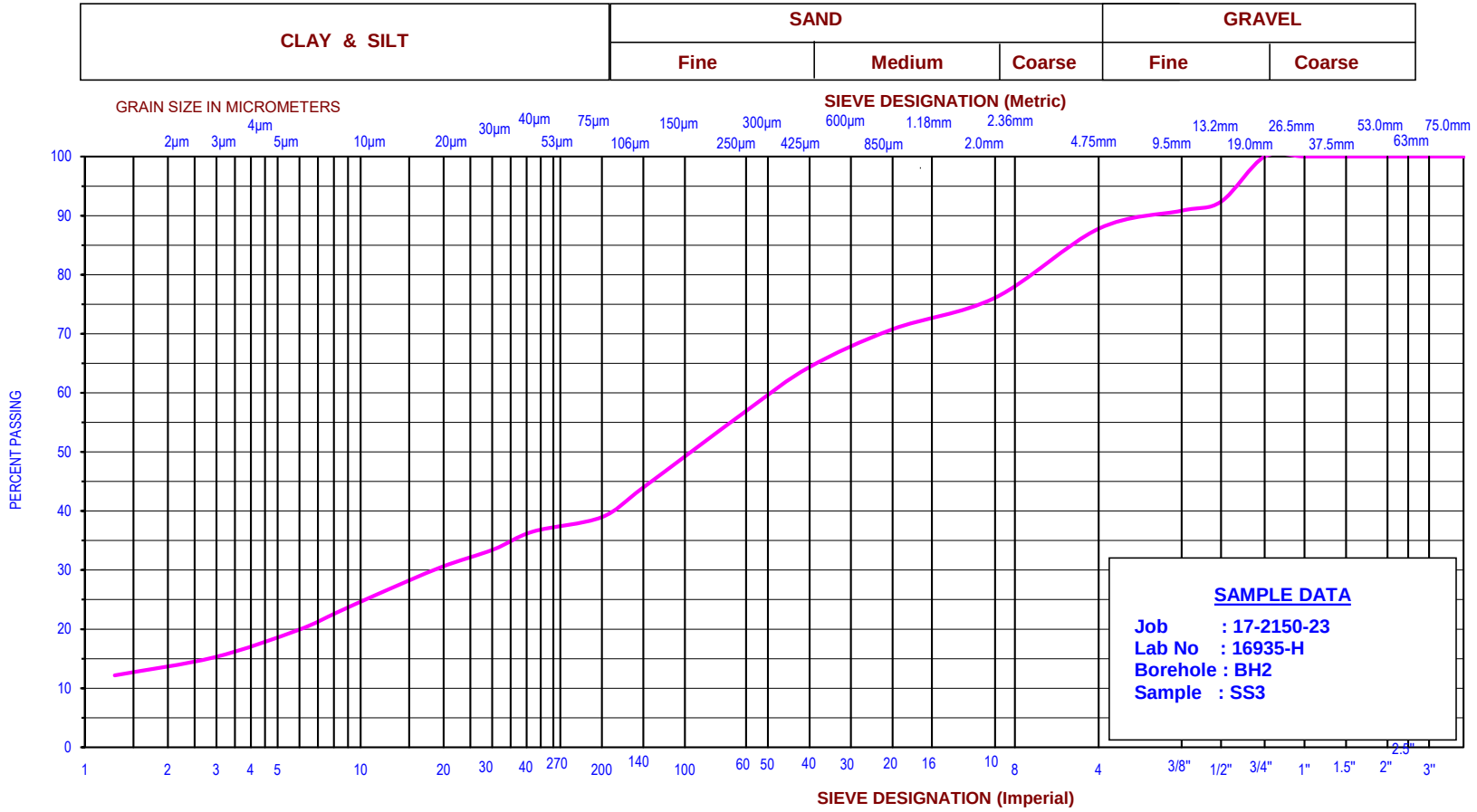
Figure 2 – BH3/RC2

Appendix 4

Geotechnical Laboratory Results

SNC-LAVALIN

UNIFIED SOIL CLASSIFICATION SYSTEM



% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	0	12	12	12	25	26	13

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1164 Clyde Court
Kingston, Ontario K7P 2E4

GRAIN SIZE DISTRIBUTION

SILTY SAND

some clay, some gravel

Client: Parks Canada

Project: Fort Wellington Rehabilitation

Location: 370 Vankoughnet Street, Prescott, ON

Date : August 28,2017

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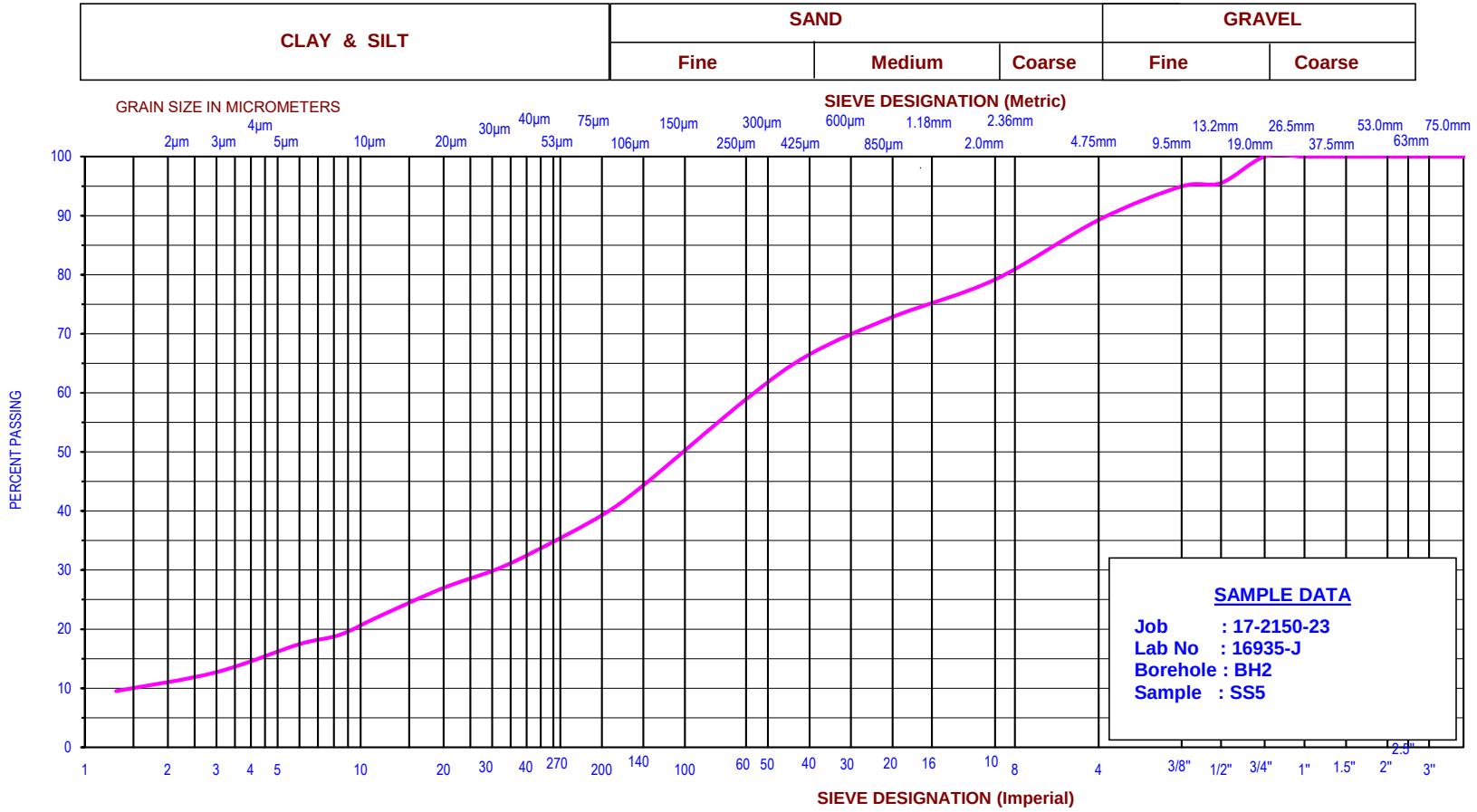

% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	0	11	10	13	27	28	11

SNC-LAVALIN 1164 Clyde Court Kingston, Ontario K7P 2E4	**GRAIN SIZE DISTRIBUTION**	**Client: Parks Canada**
		Project: Fort Wellington Rehabilitation
	SILTY SAND **some clay, some gravel**	**Location: 370 Vankoughnet Street, Prescott, ON**
		Date : August 28,2017

Appendix 5

Geophysical Investigation Report

GEOPHYSICS GPR INTERNATIONAL INC.

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September 27th 2017 GPR file: T17051B

Dylan Hill, P. Eng.
Project Manager
SNC-Lavalin
Environment and Geoscience, Infrastructure
Kingston, Ontario
1164 Clyde Court
Kingston, ON
K7P 2E4

RE: Ground Penetrating Radar Surveys along the Perimeter of Fort Wellington, Prescott, Ontario

Good day Mr. Hill:

Geophysics GPR was commissioned to perform GPR surveys along a fort defensive berm to determine bedrock depth and perform a qualitative analysis on the underlying condition of the interior of the berm.

The survey was conducted with a GSSI SIR-4000 radar system alongside a 350MHz antenna. For the purposes of this project, the 350MHz proved useful for interpretation due to the higher resolution in the upper 3 meters of investigation.

There were two principle objectives for the survey:
1) Radar profiles taken along the exterior of the fence for the purpose of mapping the bedrock depth.
2) Radar profiles taken on the top of the berm for the purpose of qualitative analysis of the interior of the berm.

Exterior Profiles
Prior to commencement of the survey it was speculated that the rock would be quite shallow, possibly less than 2 meters, however this was not the case as evidenced from this survey and borehole results. The shallowest rock was at the western extreme corner at 2.6 meters but the bedrock contact was not clear. However, there was a silty clay layer which would tend to act as a barrier. The remaining boreholes suggest around 5 meters depth and most of these areas are dominated by sands, which is typically a good sign when using ground radar. The problem is that the bedrock could be very flat so on the radar images the bedrock reflector would simply merge with some of the horizontal noise pulses.

There was one area where a contact was apparent at the south side of the fort as the antenna bends around the structure facing King St. E. The structure may have footings that dip beneath the surface at an angle, which would be apparent on the radar images. This interface is shown in Figure 2.

Interior Profiles, Berm

The signal penetration suggests a stronger concentration of dry sands and silts and the texture of the images suggest some gravel content. There are some individual targets that can only be the result of cobble size material, likely broken rock. The berm appears to be only partially similar to the immediate local overburden.

An example of a short segment of the berm scan is shown in Figure 3. The entire berm is consistent in terms of this radar appearance. Individual cobbles could be seen in the mix but it is likely mostly dominated by silts and sands.

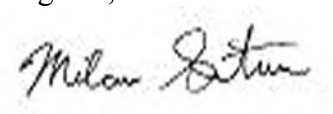
One item identified is the likely presence of an erosion mesh. Figure 4 is a map of the distribution of the mesh at the crest of the berm.
Some descriptors have been abbreviated such as

- vcm (very coarse mesh, usually 1 meter spacing)
- fm (fine mesh between 70 and 1.4m deep)
- assorted mesh has both types of mesh

6 Boreholes were cleared during the survey on the exterior of the berm.

If there are any questions do not hesitate to contact me.

Regards,



Milan Situm, P.Geo.
Manager

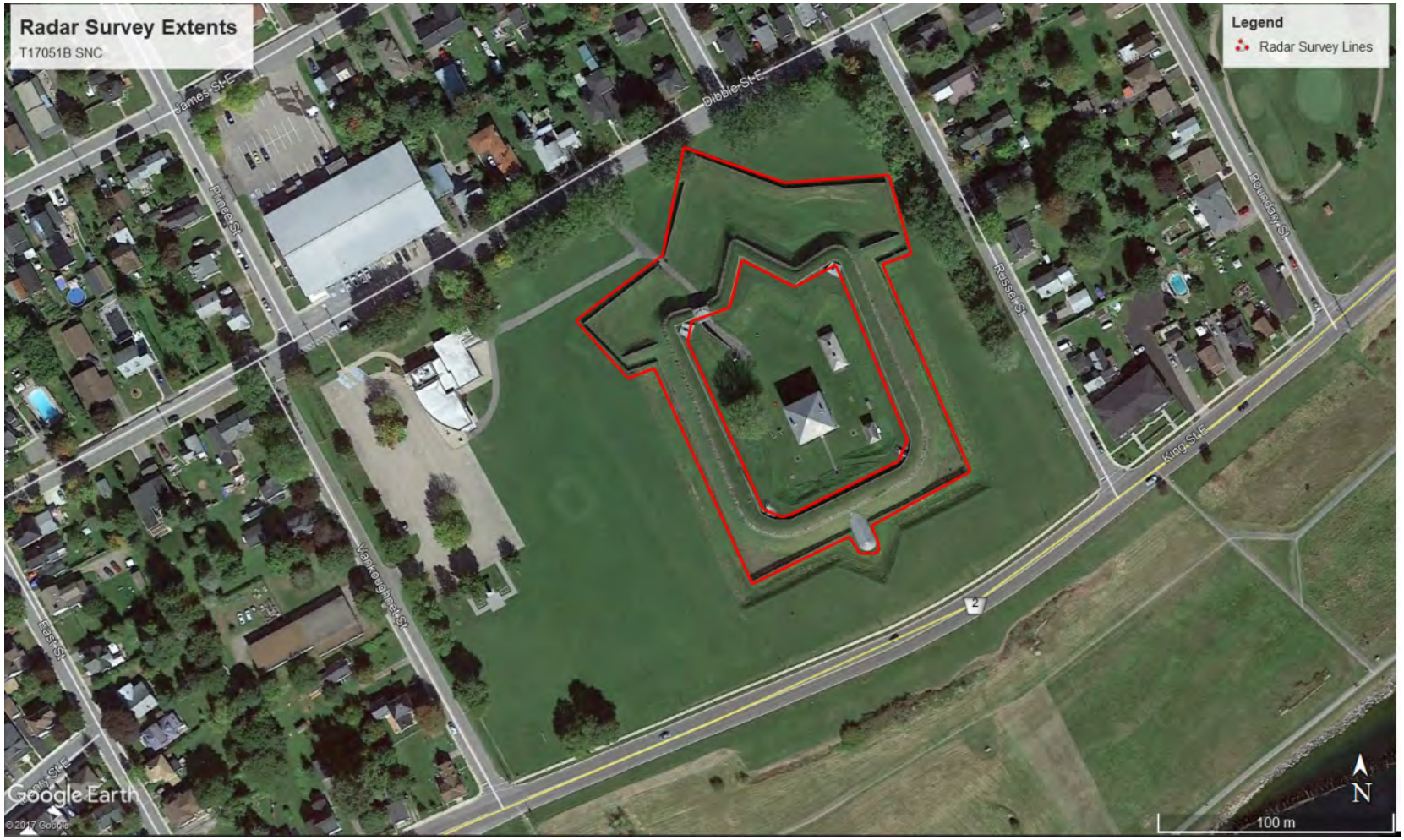


Figure 1: Radar Survey Profile lines

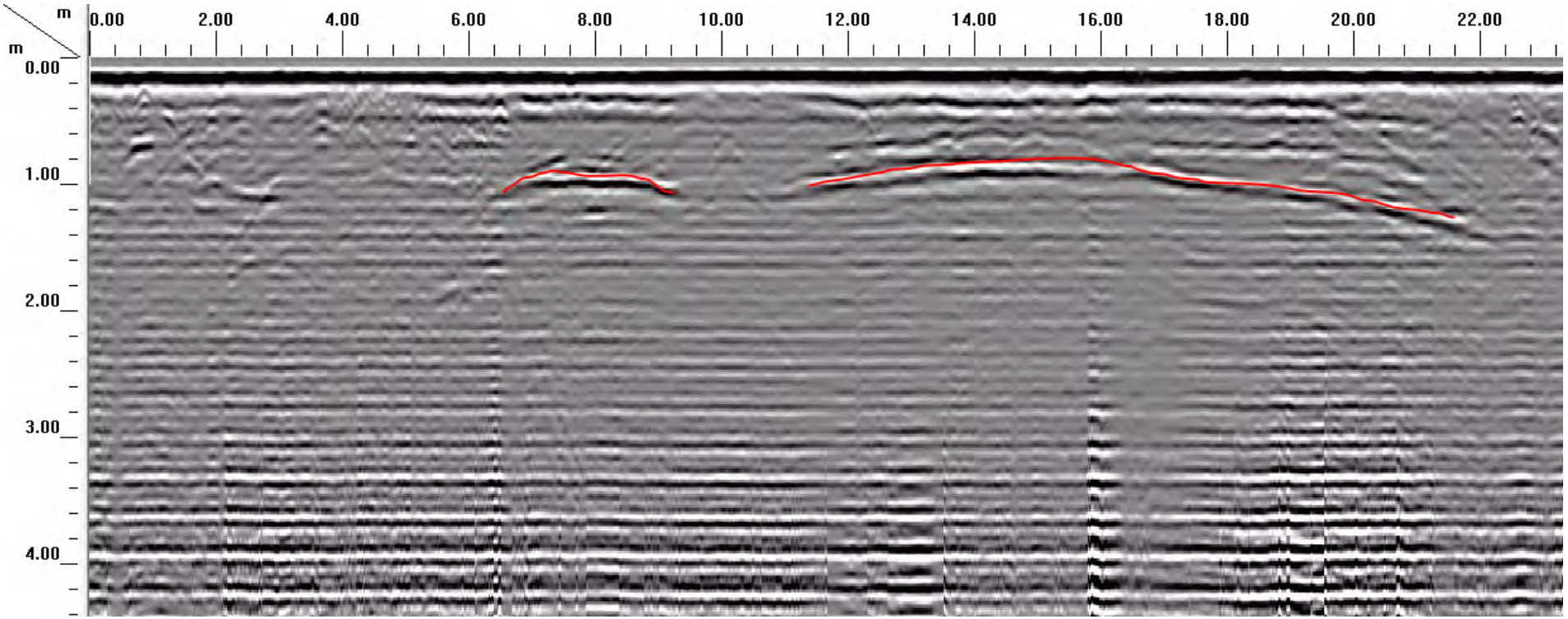


Figure 2: Radar Profile taken on the south end of the site next to sloping structure, interpreted interface highlighted

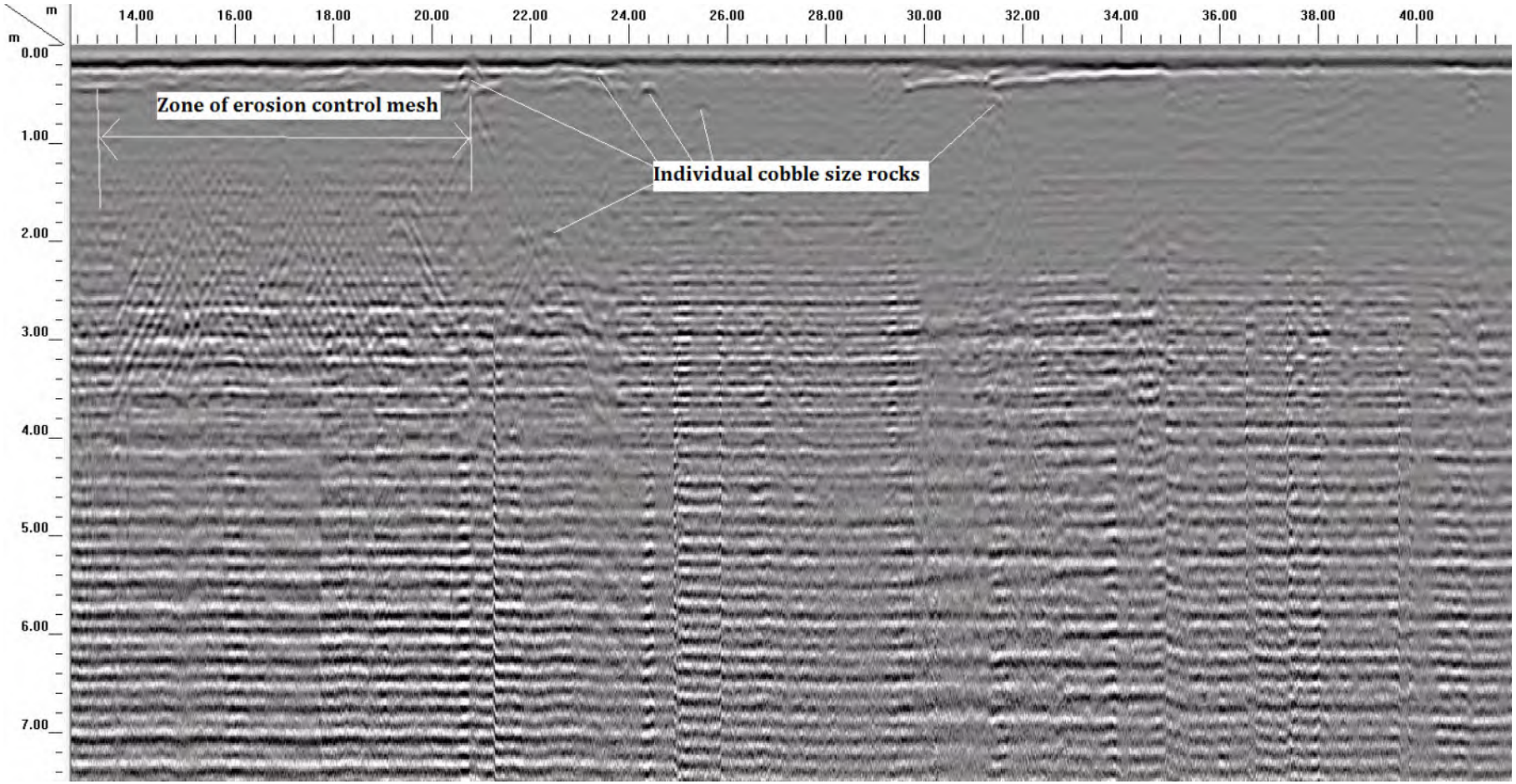


Figure 3: Radar Image taken on top of berm. Abundance of small cobble targets in upper 3m. Also fine mesh for erosion control is likely present.

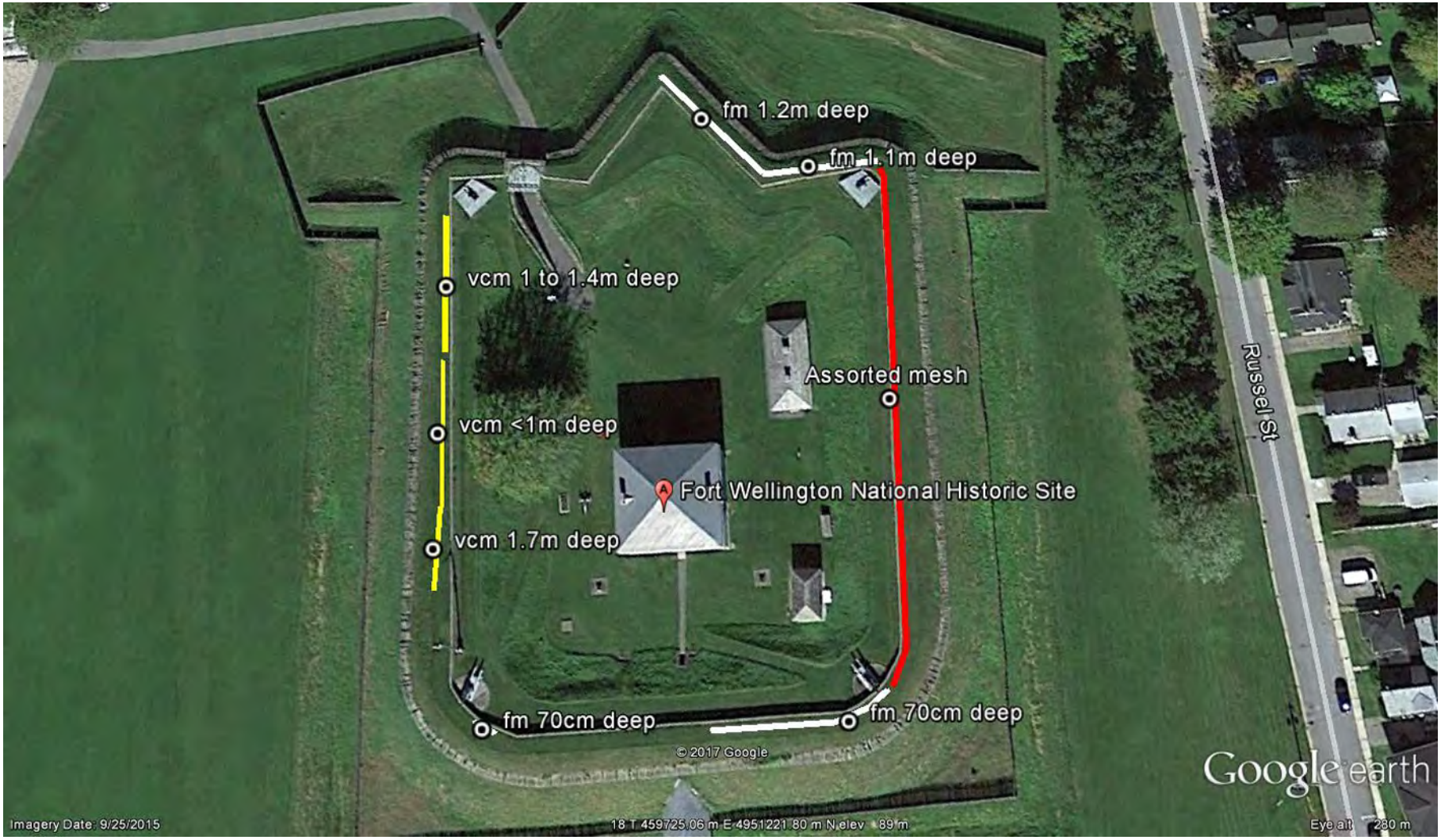


Figure 4: Interpreted Erosion control mesh
vcm – very coarse mesh approx 1 m spacing
fm – fine mesh
Assorted mesh has both types but the coarse mesh can be just below the surface

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