Government of Canada | Gouvernement du Canada

PARKS CANADA

SPECIFICATION

Trout Brook Campground
Siteworks Package

CAPE BRETON HIGHLANDS NATIONAL PARK, NS

ISSUED FOR TENDER

2018-07-12

DISCIPLINE	DATE	STAMP
Civil Specifications:	July 12, 2018	
Electrical Specifications:	July 12, 2018	

END OF SECTION

Division 01 – GENERAL REQUIREMENTS

Division 22 – PLUMBING

Division 26 – ELECTRICAL

END OF SECTION

Part 1 General

1.1 ROLES, RESPONSIBILITIES AND DEFINITIONS

.1 All references to the Departmental Representative shall mean:

.1 A representative of Parks Canada Agency.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 The Work of this Contract generally includes the supply and installation of all labour, services, materials, testing and equipment to complete the Trout Brook Campground Sitework (the Work) as indicated on the drawings and Work as indicated herein. The Work shall include but is not limited to:

.1 Adherence to the BIA.

.2 Site mobilization/demobilization.

.3 Supply, installation and maintenance of any sediment and erosion controls required during construction. Plan shall be submitted for Departmental Representative prior to the start of construction.

.4 Materials testing and quality control.

.5 Supply and installation of temporary utilities and construction facilities as required including subsequent removal from site.

.6 Supply of traffic control including traffic control devices and signage to block off the work area during the construction period. A Plan shall be submitted to the Departmental Representative at the start of construction for review and approval indicating work schedule, and how traffic controls are implemented.

.7 Submission of a record information package including mark-ups, a construction survey and a warranty and maintenance plan.

.8 Tree clearing and surface grubbing.

.9 Rough grading of the site including the supply, placement and compaction of common or imported materials and disposal of surplus materials.

.10 Supply, installation, compaction and testing of sanitary sewers including manholes and pipe. Terminations at building entrances to be clearly marked with a green stake.

.11 Supply, installation, compaction and testing of water supply pipe. Terminations at building entrances to be clearly marked with a blue stake.

.12 Supply, installation and compaction of pipe culverts.

.13 Supply, installation, testing, commissioning, demonstration, and training for a water treatment system.

.14 Supply, installation, compaction testing, commissioning, and training of a full wastewater septic field and all associated components connected to the building entrances and water treatment building connection.

.15 Supply and installation of renewable energy solar photovoltaic system to supply the electrical loads for the Water Treatment system, Water Well System and three site buildings. Supply, installation, testing, commissioning, demonstration and training for operation, annual shutdown and maintenance.

.16 Supply of buried wired phone line and pay-per-use phone for installation to the exterior of one site building.

.17 Supply of buried cables for power distribution. Overhead power lines are not permitted on this site. All power lines must be contained either underground or inside site buildings.

.18 Supply of buried conduits and cables for connection of the Water Well System and Water Treatment System's components and control panel.

.19 Supply, installation, compaction and testing of aggregate materials.

.20 Finish grading is not included in this contract.

.21 Supply and application of parking area markers.

.22 Supply and installation of topsoil and hydroseed on disturbed and exposed surfaces not included in this contract.

.23 Supply and installation of trees and other landscaping features not included in this contract.

.24 Supply and installation of wooden fencing.

.25 General reinstatement and clean-up.

.26 Drawings detail all roadway, pathways, parking areas for the purpose of showing the contractor finished disturbed surfaces and utility corridors. Contractors use of the site is restricted to these locations during construction of this contract. Contractor is not required to complete the construction of these features, but simply to use as travel and utility corridors

1.3 CONTRACT METHOD

.1 Construct Work under a lump sum contract.

1.4 WORK SEQUENCE

.1 SPEC NOTE: Consider the following three paragraphs for Project when a specific sequence of Work is required, for Departmental Representative occupancy, for partial occupancy. Edit as appropriate. Co-ordinate with Articles 'Contractor Use of Premises', 'Owner Occupancy', 'Progress Schedule' and with Drawings.

.2 Contractor to construct the Work in a continuous sequence upon contract award and complete the Work no later than August 30, 2018.

1.5 CONTRACTOR USE OF PREMISES

.1 Contractor must only work in designated work site locations and work access travel corridors which include approved roadways and trails only. The corridors and work site will be marked and agreed upon by Parks Canada and Constructor prior to commencing construction. Absolutely no damage outside of these limits is to occur by the Contractor.

.2 Contractor will have joint use of this property with Parks Canada during the construction period and must ensure all construction activities in overlapping areas are well coordinated in advance.

.3 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.4 At completion of Construction, return disturbed areas to equal condition or better condition than existed before Work started.

1.6 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING FACILITIES

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

1.7 EXISTING SERVICES

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

.2 Give the Departmental Representative 48 hours of notice for necessary interruption of services throughout course of work. Minimize duration of interruptions.

.3 Establish location and extent of service lines in area of work before starting Work by careful test excavation methods. Notify Departmental Representative of findings. Note there will be one active water well on this site during construction. Note there is a Bell Aliant emergency phone line that runs parallel to the Cabot Trail within the property of the new Trout Brook Campground

.4 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service. 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 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

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

1.8 CONSTRUCTION SURVEYING SERVICES

.1 Acquire the services of a Construction Surveyor to establish an accurate location of the installation of new Works within the construction area.

.2 Prior to commencing with infrastructure confirmations and locations, all parties involved with the test excavation should visit the site and become acquainted with current site conditions.

.3 Contractor shall have reference points established on site by the Construction Surveyor.

.4 Contractor shall survey all abandoned, capped, new and existing exposed utilities within the open trench area prior to backfilling operations.

.5 Contractor shall survey all new Works installed above and below grade. An as-built topographic survey shall be submitted to the Departmental Representative for approval in order to obtain Substantial Performance of the Work. The submittal shall include an ASCII or .csv raw points file and an AutoCAD file in dwg format.

1.9 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy of each document as follows:

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Erosion and Sedimentation Control Plan.
- .12 Traffic Plan.
- .13 Other documents as specified.

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 OF THE BID AND ACCEPTANCE FORM

.1 Lump Sum price bids 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.

1.2 MEASUREMENT AND PAYMENT

.1 LUMP SUM: All work is to be completed in a single Lump Sum Item on the Bid Form.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

1.2 ADMINISTRATIVE

.1 The Contractor shall schedule and administer project meetings throughout the progress of the work.

.2 The Contractor shall provide physical space and make arrangements for meetings at their site trailer.

.3 The Departmental Representative will record the meeting minutes and include significant proceedings and decisions and identify actions by parties.

.4 The Departmental Representative will reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and affected parties not in attendance.

.5 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.3 PRECONSTRUCTION MEETING

.1 Upon issuance of "Issued for Construction" drawings, the Contractor shall arrange a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Representatives of the Departmental Representative, Contractor, Subcontractors, field inspectors and supervisors should be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

- .1 Appointment of official representative of participants in the Work.
- .2 Schedule of Work.
- .3 Schedule of submission of shop drawings.
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities and fences (if deemed required).
- .5 Delivery schedule of specified equipment.
- .6 Site security.
- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime and administrative requirements.

.8 Monthly progress claims, administrative procedures, photographs, and hold backs.

.9 Appointment of inspection and testing agencies or firms.

.10 Insurances, transcript of policies.

1.4 PROGRESS MEETINGS

.1 During course of Work the Contractor shall schedule weekly progress meetings.

.2 Contractor, Subcontractors and Departmental Representative are to be in attendance.

.3 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

.12 Other business.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

.2 Section 01 33 00 – Submittal Procedures.

1.2 DEFINITIONS

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

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

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

.4 Construction Work Week: Monday to Friday, inclusive, will provide five-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 activity or other project element. Usually expressed as workdays or workweeks.

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

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

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

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

1.3 REQUIREMENTS

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

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

.3 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.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Provide schedule in PDF format.

1.5 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule.

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

.1 Award.
.2 Shop drawings and submittals.
.3 Permits.
.4 Mobilization/demobilization.
.5 Construction activities.
.6 Testing (as required).

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

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

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 REQUIREMENTS

.1 Section 01 45 00 – Quality Control.

.2 Section 01 78 00 – Closeout Submittals.

1.2 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings and product data 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 co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

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

.7 Verify field measurements and affected adjacent Work are co-ordinated.

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

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

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

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Nova Scotia, Canada as required.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 5 days for Departmental Representative's review of each submission.

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

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

.7 Accompany submissions with transmittal letter, in electronic PDF format, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

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

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

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.11 Submit electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.14 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.15 Submit electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Delete information not applicable to project.

.17 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copy 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 CERTIFICATES AND TRANSCRIPTS

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

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

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

.2 Province of Nova Scotia

.1 Occupational Health and Safety Act, S.N.S. - Updated 2013.

1.2 DEFINITIONS

.1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

.2 Competent Person means a person to who is:

.1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace.

.2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work.

.3 Knowledgeable about potential or actual danger to health or safety associated with the Work.

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

.4 PPE: personal protective equipment.

.5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan prior to commencement of Work:

.1 Submit within ten (10) work days of notification of Bid Acceptance. Provide three (3) hard copies and one (1) electronic PDF file.

.2 Departmental Representative will review Health and Safety Plan and provide comments.

.3 Revise the Plan as appropriate and resubmit within five (5) work days after receipt of comments.

.4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor’s overall responsibility for Occupational Health and Safety of the Work.

.5 Submit revision and updates made to the Plan during the course of Work.

.3 Submit name of designated Health & Safety Site Representative and support documentation specified in the Safety Plan.

.4 Submit building permit, compliance certificates and other permits obtained.

.5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other department of labour organization:

.1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.

.6 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.7 Submit copies of incident reports.

.8 Submit WHMIS MSDS - Material Safety Data Sheets.

1.4 COMPLIANCE REQUIREMENTS

.1 Comply with the Occupational Health and Safety Act for the Province of Nova Scotia, and the Regulations made pursuant to the Act.

.2 Comply with Canada Labour Code Part II, and the 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 1995 National Building Code of Canada, Part 8.

.2 Provincial Worker's Compensation Board.

.3 Municipal statutes and ordinances.

.4 Comply with Occupational R.S.Q., c. S-2.1, an Act respecting Health and Safety Code for the Construction Industry.

.4 In event of conflict between any provisions of above authorities the most stringent provision will 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, Ontario K1A 0S9
Tel: (819) 956-5800 (1-800-635-7943)
Publication No. L31-85/2000 E or F

.6 Observe construction safety measures of:

.1 Part 8 of National Building Code.

.2 Municipal by-laws and ordinances.

.7 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.

.8 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.

.9 Medical Surveillance: Where prescribed by legislation or regulation, obtain and maintain worker medical surveillance documentation.

1.5 SITE CONTROL AND ACCESS

.1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons:

.1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.

.2 Isolate Work Site from other areas of the premises by use of appropriate means:

.1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment.

.2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.

.3 Use professionally made signs with bilingual message in the two (2) official languages or international known graphic symbols.

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

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

.5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm.

1.6 PROTECTION

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

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

1.7 RESPONSIBILITY

.1 Be responsible for safety of persons and property on work site and for protection of employees and general public circulating adjacent to work operations 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.

1.8 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 must be sent.

.3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.9 PERMITS

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

.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 work.

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

1.10 SAFETY ASSESSMENTS

.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 and prior to commencement of work.

.2 On-going 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 subtrade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.

.2 The scope of 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 all assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.

1.11 PROJECT/SITE CONDITIONS

.1 The following are known or potential project related safety hazards at site:

.1 Work immediately adjacent/atop high steep embankments and cliffs with heavy equipment and construction personnel.

.2 Highway traffic.

.3 Other construction contractors work on site.

.2 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.

1.12 SAFETY MEETINGS

.1 Prior to commencement of work attend health and safety meeting conducted by Departmental Representative. 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 site.

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

.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.

.3 Changes in site and project conditions.

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

1.13 HEALTH AND SAFETY PLAN

.1 Develop written site-specific Project Health and Safety Plan, based on hazard assessments, prior to commencement of work. Submit plan to Departmental Representative within 7 calendar days of Contract Award date.

.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 practises 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 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:

.1 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.

.2 Federal and Provincial Departments and local emergency resources organizations, as resources organizations, as applicable laws and regulations.

.3 Officials from Parks Canada. 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.

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

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

.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 legislative compliant and shall not relieve Contractor of his legal obligations for the provision Health and Safety on the construction project.

1.14 SAFETY SUPERVISION AND INSPECTIONS

.1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.

.2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and will be assigned the responsibility and authority to:

.1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work.

.2 Monitor and enforce Contractor's site-specific Health and Safety Plan.

.3 Conduct site safety orientation session to persons granted access to Work Site.

.4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.

.5 Stop the Work as deemed necessary for reasons of health and safety.

.3 Health & Safety Site Representative must:

.1 Be qualified and competent person in occupational health and safety.

.2 Have site-related working experience specific to activities of the Work.

.3 Be on Work Site at all times during execution of the Work.

.4 All supervisory personnel assigned to the Work must also be competent persons.

.5 Inspections:

.1 Conduct regularly scheduled safety inspections of the Work on a minimum weekly basis. Record deficiencies and remedial action taken.

.2 Conduct Formal Inspections on a minimum monthly basis. Use standardized safety inspection forms. Distribute to subcontractors.

.3 Follow-up and ensure corrective measures are taken.

.6 Keep inspection reports and supervision related documentation on site.

1.15 TRAINING

.1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.

.2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.

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

1.16 MINIMUM SITE SAFETY RULES

.1 Notwithstanding 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 personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footwear (and 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.

1.17 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 will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

1.18 INCIDENT REPORTING

.1 Investigate and report 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 $10,000.00.

.3 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.

.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.

.4 Submit report in writing.

1.19 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.

1.20 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 Post all MSDS data sheets on site, in a common area, visible to workers.

.4 On building renovation projects where work is adjacent to occupied areas, locate data sheets in a public location accessible to tenant employees.

1.21 BLASTING

.1 Blasting or other use of explosives is not permitted without prior written instructions from Departmental Representative.

1.22 POWDER ACTUATED DEVICES

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

1.23 POSTING OF DOCUMENTS

.1 Post documents indicated herein and as required by Authority having jurisdiction.

.2 Post other documents as specified herein, including:

.1 Site specific Health and Safety Plan.

.2 WHMIS data sheets.

1.24 RECORDS ON SITE

.1 Maintain on site copy of safety documentation as specified in this section and other safety related reports and documents issued to or received from authorities having jurisdiction.

.2 Make available to Departmental Representative, or authorized safety representative, for inspection upon request.

1.25 BIRDS AND WILDLIFE

.1 Any food or waste that could attract birds or wildlife can only be discarded in properly sealed waste containers.

1.26 RADIO COMMUNICATIONS

.1 When radio communication is required between the Contractor's personnel, all radio equipment shall be supplied by the Contractor.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 - Cleaning.

.2 Section 01 74 19 - Waste Management and Disposal.

1.2 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

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 chemicals and filter media associated with the on-site water treatment system.

.2 Submit 2 copies of WHMIS Safety Data Sheets (SDS).

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.

.4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

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

.6 Include in Environmental Protection Plan:

.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.

.4 Descriptions of environmental protection personnel training program.

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

.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, 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 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

.1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.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, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

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

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

1.4 FIRES

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

1.5 DRAINAGE

.1 Develop and submit Erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.

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

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

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

1.6 SITE CLEARING AND PLANT PROTECTION

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

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

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

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

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas as indicated.

1.7 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

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

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

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

1.8 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

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

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.10 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Bury rubbish and waste materials on site where directed after receipt of written approval from Departmental Representative.

.3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

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

.5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

1.2 INSPECTION

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

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals.

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

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 TESTING AGENCIES

.1 Contractor shall engage a third-party materials testing agency for purpose of testing portions of Work as normally required under each Section.

.2 If defects are revealed during inspection and/or testing, 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 the Contract. Pay for costs of re-testing and re-inspection.

1.4 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.

1.5 PROCEDURES

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

.2 Submit materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

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

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

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

1.7 REPORTS

.1 Submit electronic PDF copies of inspection and test reports to Departmental Representative for review.

1.8 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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 TEMPORARY UTILITIES

.1 Contractor shall provide temporary sanitary, water and power utilities as deemed necessary to complete the works.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 51 00 – Temporary Utilities.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

.1 Identify areas which have to be gravelled to prevent tracking of mud.

.2 Indicate use of supplemental or other staging area.

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

.4 Remove from site all such work after use.

1.4 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs as required.

1.5 HOISTING

.1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment.

.2 Hoists and cranes to be operated by qualified operator.

1.6 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

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

1.7 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.9 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide measures for protection and diversion of traffic, including erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs to close off the Work site.

.2 Protect travelling public from damage to person and property.

.3 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.4 Verify adequacy of existing roads and allowable load limit on these roads. Contractor is responsible for repair of damage to roads caused by construction operations.

.5 Dust control: adequate to ensure safe operation at all times.

.6 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.10 FIRE ROUTES

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

1.11 CLEAN-UP

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

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

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

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 Nova Scotia Provincial Department of Environment's "Handbook for Construction Sites", most recent edition.

1.2 EROSION AND SEDIMENTATION CONTROL PLAN

.1 No work on site is to commence until the Contractor has submitted a marked-up site plan and detailed scope indicating the Contractor's plan for protecting the site from erosion and sediment migration and/or concerns during construction.

.2 Plan is to be reviewed by Departmental Representative prior to the start of any work. Allow 5 days for Departmental Representative to review.

1.3 DEFINITIONS

.1 Sediment: soils and other surficial materials transported by surface water as a product of erosion.

.2 Erosion: the process by which the ground surface is worn away by the action of wind and/or water. Detachment of soil particles by erosion agents, principally water, wind, ice and gravity.

.3 Watercourse: any natural or improved stream, river, creek, brook, ditch, channel, canal, conduit, culvert, drain, gully, swale or wash in which waters flow either continuously or intermittently. Same as defined in the Nova Scotia Water Act and in CEPA.

.4 Stripping: any activity which removes or significantly disturbs the vegetative surface cover including clearing, grubbing of stumps and root material and top soil removal.

.5 Site Development: the resulting condition of land improvements through the constructing, installing, placing or planting of open and enclosed storm drainage facilities, storm water management facilities, supporting foundations for utility lines, service connections, parking lots, driveways, curbs, pavements, sidewalks, bike paths, recreational facilities, patios, ground planters, ground covers, plantings, landscaping, tree and/or timber removal.

.6 Benching: a technique of grading or placement of fill to create a series of level benches or steps on a slope. Benches reduce the effective slope length and also serve to entrap sediment.

.7 Berm: a ridge that breaks the continuity of a slope.

.8 Check Dam: a small dam constructed in a gully, ditch or other similar place to decrease water velocity by reducing the channel gradient minimizing scour erosion and promote accumulation of sediment.

.9 Vegetated Buffer Strip: usually a strip of permanent vegetation left beside a stream bank to retard the flow of runoff water that causes deposition of transported materials and to protect the banks. It could also be a vegetative strip, particularly of trees or bushes, left between the construction project and adjacent property.

.10 Deposition: the accumulation of material which settles or is dropped due to slower movement of the transporting agent.

.11 Dispersion Ditch: a ditch or channel that converts a concentrated flow of runoff into sheet flow and outlets it onto areas stabilized by existing vegetation thus helping to prevent erosion.

.12 Filter Fabric: a synthetic material of woven or non-woven plastic description. Its purpose is to allow water to filter through while retaining fine soil particles and preventing them from being washed away.

.13 Land-disturbing Activity: any land change which may result in soil erosion, including but not limited to clearing grubbing, grading, excavating, transporting and filling of land.

.14 Ponding: of water shall not be permitted particularly above cut or fill slopes or on drainage terraces nor shall water be impounded on adjacent property. Adequate drainage facilities shall be provided to prevent such ponding.

.15 Rilling: a small channel not more than 30 centimetres (1 foot) deep, cut into the surface of the soil by runoff.

.16 Drainage: the removal of excess surface water or ground water from land by means of surface or subsurface drains. Soil characteristics that affect natural drainage.

.17 Erodible: susceptible to erosion.

.18 Erosive: having sufficient velocity to cause erosion. Refers to wind or water. Not to be confused with "erodible" as a quality of soil.

.19 Gradient: change of elevation per unit length; slope.

.20 Gullying: erosion of soil caused by concentrated runoff which forms a deeply-cut channel in the land surface.

.21 Rip Rap: large rock, cobbles, or boulders placed on earthen surfaces for protection of the soil against the erosive action of water.

.22 Run-off: the portion of precipitation on a drainage area that is not absorbed into the ground but is discharged into streams. Components of runoff include overland flow (sheet flow) and open channel flow.

.23 Scouring: erosion of the bed or banks of a channel, usually localized around an obstruction or structure in a channel or at the outlet of a conduit due to an increase in the water velocity around the obstruction our discharging from the conduit.

.24 Stabilization: the process of establishing an enduring soil cover of vegetation and/or mulch or other ground cover in combination with installing temporary or permanent structures for the purposes of minimizing soil erosion.

.25 Soil permeability: the ability of soil to allow water or air to move through it.

1.4 GENERAL

.1 Submit to Departmental Representative for approval and prior to any work commencing an Erosion and Sedimentation Control Plan for the Construction site. Allow 5 working days for Departmental Representative to review and approve.

.2 All items identified for installation to be maintained by the Contractor for the duration of the project and until Departmental Representative authorizes removal.

.3 Preserve all features of natural channels or watercourses.

.4 Protect all areas in close proximity to flood plains, or subject to flooding, from silt prior to any work commencing.

.5 Divert clean runoff away from exposed areas to minimize the production of sediment-laden runoff.

.6 Construct in phases. Expose only the smallest practical area of land for the shortest possible time required to perform the Work of the Contract.

.7 Schedule phases of construction so that only the areas which are actively being developed are exposed. Schedule to be approved by Departmental Representative prior to the start of any Work.

.8 Complete grading as soon as possible.

.9 Immediately after grading is complete establish permanent vegetation and surface cover, and erosion controls in the area of construction.

.10 Revegetate slopes as work progresses.

.11 Minimize grading of large or critical areas during the season of maximum erosion potential.

.12 Keep soils covered as much as possible with temporary or permanent vegetation or with various mulch material.

.13 Slopes to be roughened parallel to the contour or tracked with a cleated dozer.

.14 Tracked vehicles to have street pads to protect paved surfaces.

.15 Roll and compact soils to make it less erodible.

.16 Capture and filter all surface run-off from exposed soils.

.17 Prevent gross erosion in the form of gullies.

.18 Silt and sedimentation control measures shall be installed before beginning any work. Controls to be maintained regularly to ensure intended results.

.19 Filter run-off as it flows through an area or impound the sediment laden runoff for a period of time to allow settling of particulates. Sediment to be cleaned up and disposed of where approved by the Departmental Representative as soon as practical or when directed by Departmental Representative.

.20 Provide berms, sedimentation basins, traps and vegetative or screen filters to control sediments.

.21 Prevent erosion at the source.

1.5 PROTECTION

.1 Work is not to proceed on the construction site until the sequence of construction has been decided on for all phases, the timing of work, the planning and provision of sedimentation controls are in place and the monitoring of controls and timings are approved by the Departmental Representative.

.2 Perform a routine end of the day check to ensure all control practices are properly installed and in working order.

.3 Check weather forecast daily and inspect and repair measures before a forecast rain event.

.4 Maintain an adequate inventory on-hand of materials such as straw bales, polyethylene, gravel, rip rap, filter fabric, silt screen and stakes. Know where straw, hay, mulch (bark or sawdust) is readily available.

.5 Replace hay or straw bales used for controls after each rainfall. Bales to be monitored during periods of heavy precipitation and replaced as required. Bales are not an acceptable control during freeze periods of the year.

.6 Identify and protect catch basins or storm water receptors from being contaminated with sedimentation in areas of work and in a manner and schedule as approved by Departmental Representative.

1.6 GRADING

.1 Complete grading work as soon as possible and stabilize the bare earth by mulching seeding to grasses or compacted gravels.

.2 Keep cuts and fills on as flat a slope as possible. If the slope is steeper than 2:1 (H:V), consider retaining wall or cribbing.

.3 In erodible soils lower cuts and fills of 3:1 or 4:1 to be used. In all cases, round the top and toe of the slope to blend into existing grades of existing ground.

.4 Place fills so that there is no danger of sliding or washing onto adjoining property or into watercourses.

.5 Do not locate fill stockpiles adjacent to a stream bank unless protected with fabric filters and rip rap. Stockpile locations and method of controls to be approved by Departmental Representative.

.6 Fill stockpiles to be used up as soon as practical during the phases of work and storage areas are to be cleaned up as soon as they are no longer required to perform the work.

.7 Seeps, water table or springs encountered during construction to be reported to Departmental Representative when encountered and to have proper drainage controls determined and installed.

.8 During grading operations, exercise the necessary measures for dust control.

.9 Regrade if serious gullying or rilling of the surfaces have occurred before a vegetative cover begins to establish.

1.7 FILTER FABRIC BARRIER

.1 This type of barrier to be considered as temporary. Filter fabric barrier is more commonly referred to as a ‘silt fence’. Use to be limited to situations in which only sheet or overland flows are expected or there is that possibility during any phases of construction.

.2 Filter barriers are not to be used in a natural watercourse.

.3 These barriers are not effective when continuous flow and/or moderate to high velocities can be expected.

.4 This barrier to be used to surround a disturbed work site, where it should be installed up-slope from the area to be protected in order to prevent silt from being conveyed to an adjacent property or watercourse.

.5 Filter fabric barriers shall be cleaned out at regular intervals as be determined in consultation with Departmental Representative prior to Contract commencing and specifically after each rainfall to maintain effectiveness.

.6 Filter barriers to be located so they are protected from damage by heavy equipment operating at the Work Site.

.7 If the barrier is to be constructed across a wide ditch or swale carrying low flow, ensure that the ends of the filter are keyed-in to the sides of the ditch to prevent end flow. If the side slopes of the ditch are steep, regrade to a more stable slope.

.8 For silt fence installation:

i. excavate a 100 mm wide x 100 mm deep trench in a crescent shape across the flow path with ends pointing up slope.
ii. set wood stakes 50 mm square spaced 1 meter apart, securely into the ground along the downslope side of the trench.
iii. install the filter fabric, cutting it to the desired length and in the longest practical continuous piece as possible to avoid seams. All seamed areas to be overlapped by at least two stakes in and backed with straw bales.
iv. staple the filter fabric to the upstream side of the stakes extending the bottom 200 mm into the trench.
v. the filter fabric not to exceed 900 mm in height.
vi. backfill using excavated trench materials and compact the soil in the trench over the bottom of the filter fabric.

.14 Clean out accumulated sediment at regular intervals and after severe rainstorms and promptly repair the barrier if undercutting or end flow has occurred. Disposal of silt and sedimentation shall be at the direction of the Departmental Representative.

.15 Remove the barrier once construction work has been completed and the area is stabilized with vegetation or hard cover. In areas of vegetation under growth maintain barriers until growth has been re-established to Departmental Representative's approval. Remove and dispose of collected sediment in manner approved by Departmental Representative.

1.8 STRAW FILTER BARRIERS

.1 Do not use straw barriers in a natural watercourse.

.2 Straw filters are to be considered only as short-term measures and are to be used when treating runoff from very small drainage areas for a short period of time.

.3 Straw barriers to be used when normal flows are minimal or where conditions exist for runoff from infrequent, high-intensity rainfall, in shallow ditches or swales, along the side of waterways or along property boundaries during construction and in drainage areas less than 1 hectare in size.

.4 Clean out, repair and replace regularly and after each rain to maintain effectiveness.

.5 Straw barriers are designed to allow water to flow through not over the barrier.

.6 Straw barriers plug up with sediment very quickly and require constant surveillance and close attention to maintenance. If the bales are not replaced when plugged with sediment, a rock apron must be constructed on the downslope side of the barrier. The maximum life is approximately 3 months or considerably less under wetter conditions and successive storms. Departmental Representative to determine replacement frequency based on weather and sediment frequency run off for site.

.7 If a straw barrier is to be installed in a ditch or swale and the side slopes of the ditch are steep, regrade to a more stable slope. Excavate the sides of the ditch to allow the bales to be keyed in.

.8 For straw barrier installation:

i. Excavate the trench the width of a straw bale and the length of the barrier to a minimum depth of 150 mm below the existing grade surface.
ii. place the straw bales on their sides and tightly together in the trench. If the bales have been tied with non-degradable twine they should be placed on the flat.
iii. drive two sturdy wooden or steel stakes through each bale, deep enough to anchor them securely. Drive the first stake in each bale toward the previously laid bale to force the bales together.
iv. wedge loose straw between any cracks or other openings and scatter loose straw over the soil on the uphill side of the barrier. Subsequent movement of the loose straw tends to seal any undetected openings in the barrier.
v. backfill and lightly compact the excavated soil up to a depth of 100 mm against the up-slope side of the barrier.
vi. backfill and compact the excavated soil to ground level on the downslope side.
vii. excavate a sediment trap on the up-slope side of the barrier.

.9 Check barrier regularly and replace as necessary and as approved by Departmental Representative after each rainstorm.

.10 Remove the silt from the upside slope of the barrier and dispose in a location and manner approved by the Departmental Representative.

.11 Remove and dispose of straw barrier at completion of Work of the Contract and after possibility of erosion or sediment is eliminated.

1.9 EXCAVATIONS

.1 When excavating a trench place the excavated material on the side of the trench where the grade is sloping toward the trench.

.2 Protect ends of trench with barriers in areas where gradient runs away from trench area.

.3 Where utility cuts across roadways or paved surfaces the Contractor is to clean-up all sedimentation on road surfaces and or in areas where sedimentation is created as a result of exposed ground from the Work of the contract immediately following precipitation such as snow or rainfall.

.4 During precipitation the Contractor to place straw bales at intervals along the gutter areas of roads in selected locations and at least 3 metres of spacing prior to a catch basin and up gradient of the flow to minimize silt from entering storm water catch basins and or watercourses.

.5 Where sedimentation is being created from exposed ground as a result of the Work the Contractor is to immediately provide a fabric barrier along the edge of roadways to prevent silt from being carried to storm water systems.

.6 At the end of the contract Catch basins considered by the Departmental Representative to be contaminated with sedimentation as a result of the Work of the Contract to be cleaned out and the lines between the catch basin to be flushed by the Contractor to the satisfaction of the Departmental Representative.

.7 Disposal of sedimentation collected from the storm water system to be disposed of at location and manner as directed by Departmental Representative. This disposal can be mixed with landscaping topsoil provided it is clean of deleterious items.

1.10 CHECK DAMS

.1 The use and type of check dams to be determined by the Departmental Representative prior to the commencement of the project where possible.

.2 The purpose of check dams commonly referred to sediment or silt traps is to prevent erosion of gully or ditch bottoms: by slowing velocity of concentrated runoff; by collecting and holding moisture and soil in the bottom of gullies, thereby facilitating the establishment of stabilizing vegetation; to trap small amounts of sediment by reducing velocity and to prevent silt caused by sheet and rill erosion from being deposited on lands downstream from those being developed.

.3 Check dams are not to be used in watercourses and are only for ditches carrying storm drainage.

.4 Permanent Check dams to be constructed in accordance with the "Handbook for Construction Sites" and/or as detailed in the drawings. Permanent check dams can be used in gully bottoms where channel gradient is too steep for a vegetative lining alone and where the channel is too large for practical installation of structural linings. Permanent check dams can consist of the following types:

.1 Rock dams;
.2 Gabion Dams;
.3 Plank or Slab Dams;
.4 Sodded Earth Fill dams;
.5 Sandbag Dams;
.6 Straw Bale dams;
.7 Filter Fabric dams.

.5 Temporary check dams consist of rock dams, sandbag dams and brush damns and are primarily constructed to avoid wash-outs.

1.11 DIVERSION DITCHES

.1 Diversion ditches apply to overland runoff. Diversion of a natural watercourse is not permitted.

.2 The purpose of a diversion ditch is to reduce slope lengths; to break up concentration of runoff; to move water to stable outlets at the non-erosive velocity; to divert water away from cut or fill slopes, steeply sloping land, construction sites, buildings and residences, active gullies or other erodible areas; and low-lying areas in order to prevent flooding. The diversion ditch is also used to convey silted runoff to a vegetated area to disperse flow and filter silt.

.3 Diversion ditches to be used with caution on soils subject to slippage and or erosion and only when 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 RELATED REQUIREMENTS

.1 Section 01 77 00 – Closeout Procedures.

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

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

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

.3 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 Dispose of waste materials and debris at approved facilities.

.6 Clean interior areas prior to start of finishing work and maintain areas free of dust and other contaminants during finishing operations.

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

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly constructed surfaces.

1.3 FINAL CLEANING

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

.2 Remove waste products and debris and leave Work clean and suitable for occupancy.

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

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

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

.6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.8 Remove dirt and other disfiguration from exterior surfaces.

.9 Sweep and wash clean paved areas.

.10 Clean equipment and fixtures to sanitary condition.

.11 Clean roofs, downspouts, and drainage systems.

.12 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 - Cleaning

1.2 REFERENCES

.1 Definitions:

.1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority.

.2 Approved disposal area: Disposal area as designated by the Departmental Representative.

.3 Class III: non-hazardous waste - construction renovation and demolition waste.

.4 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/ or renovation activities.

.5 Inert Fill: inert waste - exclusively asphalt and concrete.

.6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

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

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

.9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

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

.11 Separate Condition: refers to waste sorted into individual types.

.12 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:

.1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.

.2 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.

.3 Submit prior to final payment the following:

.1 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.4 USE OF SITE AND FACILITIES

.1 Execute Work with minimal interference and disturbance to normal use of premises.

.2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

1.5 WASTE PROCESSING SITES

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

1.6 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations so as to not interfere with Work.

.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 designated disposal facility.

.5 Protect structural components not removed and salvaged materials from movement or damage.

.6 Protect surface drainage, mechanical and electrical from damage and blockage.

.7 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.

.8 Separate and store materials produced during project in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

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

1.7 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste type into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

1.8 SCHEDULING

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

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

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 78 00 – Closeout Submittals.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: conduct 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 submit verification that corrections have been made.

.2 Request Departmental Representative's inspection.

.2 Departmental Representative's Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, adjusted, balanced and fully

.4 operational.

.5 Operation of systems: demonstrated to Departmental Representative's

personnel.

Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.

.2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

.6 Commencement of Lien and Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment:

.1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.2 When Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

.8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 77 00 – Closeout Procedures.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content 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.

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide CAD files in .dwg format on CD or memory stick.

.10 Provide PDF format of Binders, one volume per PDF file, bookmark each separate product and system with description of product and major component parts of equipment.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Departmental Representative 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 identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Departmental Representative one record copy of:

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

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

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line drawings, and in copy of Project Manual.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Record information in AutoCAD .dwg files.

.5 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.6 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

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

.8 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

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

.1 Prepare a complete in-trench survey for all utilities.

.2 Prepare a complete as-built topographical survey to capture all surface features.

.2 Locate all roadways, pads, buildings, trees, shrubs, flag poles, bollards, posts, abandoned utilities, capped utilities and new utilities within the construction area.

.3 Locate sewer manholes, water valve chambers and catchbasins c/w inverts indicated by north, south, east, west location.

.4 Locate electrical manholes, poles, transformers, switching cubicles and specialty lights.

.5 Survey to be completed by a Construction Surveyor and be a registered Nova Scotia Land Surveyor.

.6 Provide survey on CD or memory stick in AutoCAD .dwg format along with .csv or ASCII file of raw data points.

1.8 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan to Departmental Representative.

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

.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 applicable item of work.

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

.5 Co-execute submittals when required.

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

.6 Respond in timely manner to oral or written notification of required construction warranty repair work.

.7 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.9 DELIVERY SCHEDULE

.1 Accompany Record Information submissions with a transmittal containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Other pertinent data.

.2 Within three weeks of substantial completion, or as otherwise agreed, the Contractor shall deliver the Record Information package with the data required as identified herein.

.1 Allow ten working days for the Departmental Representative's review of each submission.

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 22 31 13 – Water Treatment System.

.2 Section 23 56 13.01 - Photovoltaic Solar Panels.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate operation, maintenance and winterization procedure of equipment and systems to Departmental Representative's personnel two weeks prior to date of final

.2 inspection.

Departmental Representative: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:

- .1 Verify conditions for demonstration and instructions comply with requirements.
- .2 Verify designated personnel are present.
- .3 Ensure equipment has been inspected and put into operation in accordance with Section 22 31 13 – Water Treatment System.
- .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 22 31 13 – Water Treatment System and equipment and systems are fully operational.
- .5 Ensure equipment has been inspected and put into operation in accordance with Section 23 56 13.01 - Photovoltaic Solar Panels.
- .6 Ensure testing, adjusting and balancing has been performed in accordance with Section 23 56 13.01 - Photovoltaic Solar Panels and systems are fully operational.

.4 Demonstration and Instructions:

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, and winterization procedure.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction. Include recommendations on winterization of
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Instructions: ensure adequate amount of time required for instruction of each item of equipment or system.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide three (3) copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.4 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Departmental Representative's personnel.

.2 Provide written report that demonstration and instructions have been completed.

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 SECTION INCLUDES

.1 Commissioning, testing and documentation.

.2 Audit testing and the commissioning auditor.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 DEFINITIONS

.1 Commissioning: The process for achieving, verifying, and documenting that the facility and its systems are planned, designed, installed, and tested to ensure that they meet the original project requirements established by the Departmental Representative.

.2 Commissioning Team:

.1 Departmental Representative: Representative of the Departmental Representative, as defined in the Agreement.

.2 Contractor Representatives: Representatives of the Contractor, including any sub-contractors whose scope of work includes items requiring commissioning.

.3 Testing Agency: Specialty agency engaged by the Departmental Representative to perform tests on components or systems to verify conformance to Departmental Representative's requirements or specified requirements.

.3 Commissioning Documents:

.1 Commissioning Plan: A project-specific document which defines the scope and approach to commissioning of this facility.

.2 Submittal: Contract submittal, as specified in Contract Documents.

.3 Static check certificate: A document used to verify equipment data actually installed, prior to startup or operation.

.4 Operating check certificate. A document used to verify equipment operation, including performance statistics.

.5 Startup Reports: Report prepared by equipment startup personnel, including start-up sequence, and performance statistics.

.6 Balancing Report: Report prepared by the balancing agency, indicating initial and final system performance.

.7 Maintenance Manual: A document containing detailed descriptions and technical information about start-up, operation and maintenance of equipment.

1.4 METHODOLOGY

.1 The Contractor shall develop a Commissioning Plan, including as a minimum the management of commissioning meetings, and the management of project-specific commissioning documents.

.2 Commissioning Plan to include:

.1 Assembly of Departmental Representative's requirements, including design criteria, performance goals, budgets, and schedules.

.2 Scheduling and chairing of commissioning meetings between team members.

.3 Development of static and operating check certificates for individual equipment.

.4 Assembly of commissioning reports, including testing and balancing reports, maintenance manuals, startup reports, and testing reports.

.5 Verification of data by testing agency.

.6 Audit procedure, to be performed in the event of dispute or failure.

.3 Execute the commissioning plan.

1.5 REGULATORY REQUIREMENTS

.1 Arrange for regulatory authorities to witness those commissioning start up procedures which are also required by regulatory authorities.

.2 Obtain certificates of approval and for compliance with regulations from Authorities Having Jurisdiction; include copies of certificates with start up reports.

1.6 CONTRACT COMMISSIONING REQUIREMENTS

.1 Witnessing: Allow commissioning team members to witness starting, testing, adjusting, and balancing procedures.

.2 Costs: Pay costs associated with starting, testing, adjusting, and relevant instruments and supplies required to perform those duties.

.3 Employ experienced personnel for equipment startup and commissioning, who are able to interpret results of readings and tests, and report the system status in a clear and concise manner.

.4 Provide all equipment required to perform testing, balancing, and commissioning of systems. Calibrate instruments used in start up as accurate; provide calibration certificates if requested by the Commissioning Manager.

.5 Utilize equipment check certificates and other commissioning documents required by the Commissioning Manager.

.6 Verify that equipment is installed in accordance with Contract Documents, and reviewed shop drawings. Sign and date static check certificates.

.7 Do not start up equipment unless static check sheets have been completed and submitted.

.8 Complete in detail and sign operating check certificates.

Part 2 Products

Part 3 Execution

3.1 COMMISSION TESTING

.1 Allow for work, effort, and associated costs necessary to assist the Departmental Representative, for fulfilment of a commission testing process of the facility and Work.

.2 Coordinate, cooperate, and harmonize efforts with the Departmental Representative.

.3 Commission testing will include a random testing and evaluation process as determined by the Departmental Representative.

.4 System and device checks to be suitably logged, tabulated, signed, and incorporated into project Operating and Maintenance Manuals:

.1 Prior to start of testing, provide two (2) complete sets of up-to-date contract drawings and specifications including addenda to the Commissioning Manager.

.2 Provide one (1) copy of each approved notice of change and clarification.

.3 Coordinate site visits by the Departmental Representative and the affected parties during warranty periods.

.5 The commissioning process will not:

.1 Preclude the duties and responsibilities described in the Contract Documents nor the requirements and obligations of the Contract.

.2 Circumvent any required warranties.

.3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.

.6 Prior to commission testing, perform the following and provide copies to the Departmental Representative, of component and assembly Contract Document compliance:

.1 Static test certificates.

.2 Equipment operating certificates.

.3 Three (3) copies of valve tag list.

.4 Inspection certificates from authorities having jurisdiction.

.5 Required copies of shop drawings.

.6 Manufacturer's operating and maintenance brochures of all major equipment.

.7 Ensure all systems have been started, adjusted to design criteria, and are functionally operational, ready for independent testing.

.8 Cooperate with the Departmental Representative in advance of activating operating systems.

.9 Test results that reveal failure to conform to the Contract Documents, will result in the Departmental Representative arranging and paying to correct the Work at the Departmental Representative's discretion, and recovering all associated costs from the Contractor.

3.2 AUDIT TESTING AND THE COMMISSIONING AUDITOR

.1 In the event on non-compliance or test failure described in the commission testing process above, comply with the following requirements.

.2 Allow for work, effort, and associated costs necessary to assist an Departmental Representative appointed and remunerated Auditor, for fulfilment of a further audit testing of the facility and Work.

.3 Coordinate, cooperate, and harmonize efforts with the Auditor.

.4 Audit testing will include further random testing and evaluation as determined by the Auditor, and the Departmental Representative.

.5 Suitably log, tabulate, and incorporate signed system and device check certificates into Operating and Maintenance Manuals.

.6 Coordinate site visits by the Auditor, Departmental Representative and the affected parties during warranty periods.

.7 The audit process will not:

.1 Preclude the duties and responsibilities described in the Contract nor the requirements and obligations of the Contract.

.2 Circumvent any required warranties.

.3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.

.8 Cooperate with the Auditor prior to testing of operating systems.

.9 Test results that demonstrate failure to conform to the Contract Documents, may result in the following, at the Departmental Representative's sole discretion:

.1 Complete rejection of the subject component, assembly, or system.

.2 Removal of defective items from the Work.

.3 An adjustment credit to the Contract Price for the Departmental Representative's estimated value of the subject item plus remuneration for associated damages and inconvenience.

.4 Provision of a suitable substitute Product in place of the defective Product.

.5 Substituted Products will be required to be commissioned and audited and undergo the same scrutiny as described for commission testing and audit testing described above.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 78 00- Closeout Submittals.

.3 Section 01 74 11- Cleaning.

1.2 WORK INCLUDED

.1 This section specifies requirements for the supply and installation of a water treatment system at the Trout Brook campground. Work generally includes the supply, installation, commissioning, and training for a series of water treatment components forming the overall water treatment system.

1.3 REFERENCE STANDARDS

.1 CSA Group

.1 CSA B51-14, Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CSA B137.3 – Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications

.2 ASTM

.1 ASTM D2241 – Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR) PVC

.3 NSF

.1 NSF-PW – NSF approved for potable water

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for water treatment devices and components and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia, Canada.

.2 Indicate:

.1 Equipment including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

.2 Descriptive narrative and schematic details on water treatment equipment arrangement.

.4 Maintenance Manuals:

.1 Provide operating and maintenance data in accordance with Part 3 – Section 3.8.

.5 Maintenance Parts:

.1 Provide manufacturer's recommended parts list.

.2 Indicate parts to be available for use on site within 24 hours.

.3 Provide spare parts that cannot be made available on-site within 24 hours.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for water treatment devices and components for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MANUFACTURER

.1 Supplier of the water treatment system shall have proven experience supplying systems of similar configuration and trained service technicians available within 6 hours' driving time from the Trout Brook campground.

.2 Supplier shall have local service representation.

2.2 DESIGN CRITERIA

.1 Site water is supplied from groundwater via a single potable well drilled on-site. Design shall meet the Potable Water Guidelines and Standards for Parks Canada Agency. Finished water quality shall meet the Health Canada Guidelines for Canadian Drinking Water Quality.

.2 Design Criteria:

.1 Peak day flows: 1 L/s.

.2 Average day flows: 9,000 L/day.

.3 Water Quality Objectives:

.1 Primary and secondary disinfection required. Primary disinfection must achieve 4-log reduction of viruses.

.2 Finished water quality shall meet the Health Canada Guidelines for Canadian Drinking Water Quality for aesthetic objectives (AO) and maximum allowable concentrations (MAC).

.4 Electrical power supply:

.1 Electrical power will be supplied by the general contractor or electrical sub-contractor. 120V 15A duplex receptacles will be provided for the attachment of appliance cords and plugs connected to the water treatment devices.

.2 Electrical power will be derived from an on-site prime-power generator supplying 120/240V 1-phase 3-wire grounded service.

2.3 PLASTIC PIPE

.1 Type 12454 Polyvinyl Chloride (PVC): to CAN/CSA B137.3 unless otherwise noted.

.1 SCH80 for pipes 150mm and smaller.

2.4 VALVES

.1 Valves shall be a SCH 80 PVC compound that complies with NSF 61.

.2 Check valves shall be ball-type check valves.

.3 Air release valve to have 19 mm inlet size, 1.6 mm orifice.

.4 Backpressure sustaining valve to have an adjustable setpoint. Operational setting to be 207 kPa.

.5 Pressure relief valve to have adjustable setpoint. Operational setting to be 689.5 kPa. Provisions to be made for drain to sanitary system.

2.5 PRESSURE TANKS

.1 General: to include steel pressure tanks with internal bladder and integral standpipe, pressure switch, ready for piping connections as indicated.

.2 Tanks to be heavy-gauge steel with an electrostatically applied polyester paint finish, and ready for use with a 482 – 620.5 KPa (70/90 psi) pressure range system.

.1 Maximum operating pressure: 860 KPa.

.2 Total storage capacity: 635 L.

.3 Internal bladder to be one-piece, seamless PVC, made from FDA-listed material.

.4 Pressure switch to be capable of operating between 482 – 620.5 KPa, with a pump run time of no more than 2 minutes.

.5 Pressure sensor to be capable of reading gauge pressure.

2.6 PRESSURE GAUGES

.1 General: to include self-contained liquid-filled pressure gauge with pressure dial and gauge face reading in PSI pressure units.

.2 Sensor to be resistant to freezing, with liquid silicone fill:

.1 Temperature: 66°C (150°F) max

.2 Connection: Brass ¼ NPT

.3 Ranges: Vacuum thru 160 psi

.4 Accuracy: 3-2-3%

2.7 TURBIDITY/SEDIMENT FILTERS

.1 General: to include wall-mount housing and removable cartridge, ready for piping connections as indicated.

.2 Housing to be high grade polypropylene, with EPDM o-rings, or suitable alternative.

.1 Maximum pressure for housing: 690 kPa.

.2 Maximum flow rate for housing: 1.00 L/s for single unit

.3 Filter cartridge to high-grade polypropylene, or suitable alternative.

.1 Maximum pressure for filter cartridge: 690 kPa.

.2 Micron size: 25 um.

.3 Maximum flow rate for filter cartridge: 1.00 L/s for single unit.

.4 Head loss through filter to be < 6.9 kPA at 1 L/s.

.5 Temperature rating: 4.4 – 62.8 °C.

2.8 IRON REMOVAL

.1 General: to include dual composite pressure vessels plumbed in parallel, granular catalytic filter media and electronic MR backwash control valves ready for piping and wiring connections as indicated.

.2 Control valve to be capable of operating as a filter-only system or allow for a regeneration process, and have cycling and backwash capabilities.

.1 Pressure operating range: 138 kPa to 862 kPa.

.2 Service flow rate: 1.70 L/s at 103 kPa loss.

.3 Backwash flow rate: 1.70 L/s at 172 kPa loss.

.3 Granular filter media to be capable of iron removal to concentrations below 0.3 mg/L.

.1 Expected volume of filter media: 0.06 m^3.

.2 Service flow rate: 0.38 – 0.76 L/sec/0.03 m^3 of media.

.3 Backwash flow rate: 0.50 – 0.60 L/sec/0.03 m^3 of media.

.4 Composite pressure vessel to be sized for storage of media plus required free board.

.5 Provisions to be made for drain to sanitary system.

2.9 ARSENIC/LEAD REMOVAL

.1 General: to include dual composite pressure vessels plumbed in parallel, adsorbant and electronic MR backwash control valves ready for piping and wiring connections as indicated.

.2 Control valve to be capable of operating as a filter-only system or allow for a regeneration process, and have cycling and backwash capabilities.

.1 Pressure operating range: 138 kPa to 862 kPa.

.2 Service flow rate: 1.70 L/s at 103 kPa loss.

.3 Backwash flow rate: 1.70 L/s at 172 kPa loss.

.3 Adsorbant to be capable of iron removal of arsenic and lead to concentrations below 10 µg/L.

.1 Expected volume of filter media: 0.09 m^3.

.2 Service flow rate: 0.50 – 0.60 L/sec/0.03 m^3 of media.

.3 Backwash flow rate: 0.50 – 0.60 L/sec/0.03 m^3 of media.

.4 Head loss: <34 kPa through media.

.4 Composite pressure vessel to be sized for storage of media plus required free board.

.5 Provisions to be made for drain to sanitary system.

2.10 WATER SOFTENER

.1 General: to include softener tanks (active and standby), brine tank, brine distribution system, regenerating manifold and control system, ready for piping and wiring connections as indicated.

.2 Control valve to be capable of operating system as alternating, allow for a regeneration process, and have cycling and backwash capabilities.

.1 Maximum operating pressure: 862 kPa.

.2 Service flow rate: 2.3 L/s at 103 kPa loss.

.3 Softener tank to be constructed of a material suitable for application in potable water processes and compatible with selected resin.

.1 Resin removal requirements: 120,000 grains.

.2 Peak flow rate: 1.3 L/s.

.3 Expected volume of resin: 0.11 m^3.

.4 Brine tank to be constructed of a material suitable for application in potable water processes and compatible with selected brine. Brine tank to be sized to supply sufficient brine for the selected softener system.

.5 Provisions to be made for drain to sanitary system

2.11 BOOSTER PUMP

.1 General: to include self-contained pressure-boosting pump capable of sustaining a constant outflow pressure at variable flow rates.

.1 Maximum setpoint: 586 kPa.

.2 Operational setpoint: 482.6 kPa.

.3 Maximum pressure: 793 kPa.

.4 Service flow rate: 2 l/s.

.5 Suction lift: 8 m.

2.12 LIQUID CHLORINATOR

.1 General: to include simplex wall mounted peristaltic chemical metering pump system for injecting 12% Sodium Hypochlorite. All piping, fittings, interconnecting wiring, and electrical controls external to the system shall be supplied and installed by the contractor.

.2 Peristaltic metering pump to be made of suitable materials of construction for 12% Sodium Hypochlorite and have removable pump head for ease maintenance.

.1 Capacity range: 0.006 – 30 L/hr.

.2 Maximum operating pressure: 689 kPa.

.3 Injection point: single point injection.

.3 Dose rate of peristaltic metering pump to be flow-paced. Dosing to be controlled by in-line flow meter.

2.13 FLOW METER

.1 General: to include water meter capable of water flow measurement in single direction, complete with totalizer, low-flow measuring capacity and connection capabilities to selected chlorine pump to allow for flow-paced chlorine dosing. All piping, fittings, interconnecting wiring, and electrical controls external to the system shall be supplied and installed by the contractor.

.1 Capacity range: 0.09 – 22 l/s.

.2 Maximum operating pressure: 1,600 kPa

.2 Flow meter to be capable of digital and analog output. Meter to be capable of communication to selected chlorine pump to allow for flow-paced chlorine dosing.

2.14 CHLORINE CONTACT TANKS

.1 General: to include steel pressure tanks with internal flow system capable of achieving required system contact time for primary disinfection with 12% Sodium Hypochlorite.

.1 Virus reduction: 4 log, or 99.99%.

.2 CT value: 6.

.3 Contact Time: 12 minutes.

.4 Residual free chlorine: 0.5 mg/L.

.2 Contact tank to provide a minimum baffle efficiency of 0.4.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for water softener 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.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Install in accordance with manufacturers recommendations and as indicated.

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.

3.5 INSPECTION, TESTING AND START-UP

.1 Provide the services of qualified servicemen, mechanics or other trained personnel of the equipment suppliers or manufacturers to check the complete installation and be present for start-up of the equipment. Submit a written report signed by the equipment manufacturer's representative to the Departmental Representative stating the following:

.1 That satisfactory installation of equipment has been performed and outlining any modifications that have been made as a result of the commissioning or testing of the equipment at no additional cost to the Contract.

.2 That the equipment is now ready for permanent operation.

.3 That the operation and maintenance instructions for the equipment have been presented to the Departmental Representative.

.4 Advise the Departmental Representative in writing at least one (1) week in advance of the proposed date for testing and start-up. Provide all necessary tools, materials and equipment for carrying out tests. Conduct all tests in the presence of the Departmental Representative.

.5 Replace defective material or equipment with new material or equipment. Bear all cost including re-testing and making good.

.2 Test all pipework:

.1 Only hydrostatic pressure testing shall be acceptable for PVC/CPVC pipe.

.2 Hydrostatic pressure testing at 1.5 maximum operating pressure for two (2) hours in accordance with ASTM F2261.

.3 No leakage will be allowed.

.3 Demonstrate Effectiveness:

.1 Effectiveness of treatment components to meet required drinking water criteria to be demonstrated through analytical testing, to the satisfaction of the Departmental Representative.

.4 Submit a commissioning and start-up report within one (1) month of start-up. The report should include but not be limited to:

.1 Date and attendees.
.2 Equipment identification and logging.
.3 Site inspection comments.
.4 Equipment installation comments or photos.
.5 Deficiencies.
.6 Start-up activities and checks.
.7 Baseline or initial operating parameters, settings and/or measurements (for example: regen cycle settings, chlorine dosing, etc.)
.8 Site and equipment photos at start-up.
.9 Any other information recommended in the manufacturer's start-up report.

3.6 OPERATION AND MAINTENANCE MANUALS

.1 Supply three hard copies of Operations and Maintenance Manuals for key equipment in the treatment systems and one electronic file copy in PDF format.

.2 Content shall include but not be limited to:

.1 Transmittal & key contacts.
.2 System start-up reports.
.3 Detailed equipment and components list with descriptions and part numbers.
.4 Technical data sheets for all components.
.5 Manufacturer's installation guides.
.6 Manufacturer's operation and maintenance guides.
.7 Winterization procedures.
.8 Pump repair guide.
.9 Control panel operation and maintenance guide.

3.7 DEMONSTRATION AND TRAINING

.1 Provide classroom and on-site training for Departmental Representative's personnel in accordance with Section 01 79 00 - Demonstration and Training.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control

.3 Section 01 61 00 - Product Requirements.

.4 Section 01 70 00 - Contract Closeout.

.5 Section 01 74 11 - Cleaning.

.6 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.7 Section 01 78 00 - Closeout Submittals.

.8 Section 06 10 00 - Rough Carpentry.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.1 Institute of Electrical and Electronics Engineers (IEEE)/National Electrical Safety Code Product Line (NESC).

.1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit in accordance with the following sections unless superseded by more stringent specifications included elsewhere.

.3 Submit for review single line electrical diagrams.

.1 Electrical distribution systems.

.4 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit:

.1 Functional description of equipment.

.2 Technical data for all devices.

.3 Device location plans and cable lists.

.4 Devices mounting location detail drawings.

.5 Typical devices connection detail drawings.

.5 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit two copies of 24 in. x 24 in. (600 mm x 600 mm) minimum size drawings to inspection authorities.

.6 If changes are required, notify Departmental Representative of these changes before they are made.

.6 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment or material is not available, submit such equipment or material to inspection authorities for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.7 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Single line electrical diagrams for each electrical distribution system.

.3 Description of system operation.

.4 Description of each subsystem operation.

.5 Operation instructions, to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.6 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.

.7 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

.8 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.9 Post instructions where directed.

.10 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.11 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

.3 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.4 As-Built Record Drawings.

.1 General:

.1 The Contractor shall keep an accurate record of as-built conditions. Record any variations from the contract documents, showing all changes made on site, including but not limited to, actual dimensions, elevations, inverts, sizes and other description notations.

.2 Hard copy submission:

.1 Hard copies to be submitted in conjunction with required electronic files.

.2 All as-built drawings are to be prints of the electronic version and are to be identical to the CAD drawings. All electronic copies of as built record drawings are to bear the electronic seal of the designer as per the hard copy.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, packaging materials.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified equipment or material is not available, submit such equipment or material to inspection authorities for special approval before delivery to site as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

.4 All devices, equipment, and systems must be capable of off-season storage in-place without supplemental heat, and without the need to “winterize” any item(s).

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment, and controls, as indicated.

.2 Verify coordination of overload and overcurrent protective devices for coordination as required by the Canadian Electrical Code (CSA22.1-2018) rule 38-062.

.3 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections or as shown on mechanical drawings.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of CSA C22.1, the authority having jurisdiction and the Departmental Representative.

.2 Decal signs, minimum size 175 mm x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 All switchboards, panels, disconnect switches, power/voice/data/ outlets, transformers, control panels, and motor starters are to be provided with lamicoid nameplates. Nameplates shall be affixed true and level, and plumb in all instances.

.2 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid, matt white finish face, black core, mechanically attached with self tapping screws lettering accurately aligned and engraved into core.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.3 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.4 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.5 Allow for minimum of twenty-five (25) letters per nameplate.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of ‘equipment green’ finish enamel.

Part 3 Execution

3.1 ADMINISTATION

.1 Obtain and pay for all necessary permits required to perform the work. Comply with all permit requirements and conditions.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the 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.

3.4 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do complete installation in accordance with the National Building Code of Canada 2015 Edition except where specified otherwise.

.3 Do underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

.4 All drawings, diagrams, sketches, raceway locations and routings, cable locations and routings, etc. illustrate intent only. Symbols on drawings indicate approximate locations. Refer to architectural plans and details. The contractor shall make all necessary adjustments to suit supplied equipment and shall achieve the required functionality.

.5 Establish a detailed work plan with the general contactor. Submit the workplan to the Departmental Representative for approval.

.6 Coordinate electrical work requirements with all other trades on site to avoid conflict. Report any conflicts to the Departmental Representative. All electrical and control circuits provided for mechanical equipment shall be coordinated with the mechanical contractor. Verify equipment nameplate ratings prior to installation and connection and report any discrepancies to the Departmental Representative. Coordinate routing and final installation locations on site with mechanical trades. Provide all necessary equipment, raceways, fittings, fasteners and device boxes to provide a complete system. Coordinate all routing of data/communications raceways with communications contractor.

.7 Coordinate the sealing of all penetrations created by new installation with the general contractor. Fire-rated CSA approved compound required upon entering or exiting data/server rooms. Fire rating integrity in all other areas shall be maintained.

3.5 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.6 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 m, and information is given before installation.

.3 Locate light switches on latch side of doors.

3.7 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 Install electrical equipment at following heights unless indicated otherwise or superseded by other Codes or Standards.

.1 Local switches: 1420 mm.

.2 Light switches: 1420 mm.

.3 Wall receptacles:

.1 General: 300 mm.

.2 Exterior: 450 mm.

.3 Above top of counters or counter splash backs: 178 mm.

.4 Panelboards: as required by Code or as indicated.

.5 Interior telephone outlets: 300 mm.

.6 Exterior telephone outlets: 450 mm.

.3 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

3.8 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.9 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters, and associated control equipment including sequenced operation of systems where applicable.

.5 Insulation resistance testing:

.1 Test circuits, feeders and equipment rated up to 350 V with a 500 V instrument.

.2 Check resistance to ground before energizing.

.3 Carry out tests in presence of Departmental Representative.

.4 Provide instruments, meters, equipment, and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.10 SYSTEM STARTUP

.1 Instruct Departmental Representative in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.11 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CAN/CSA-C22.2 No.18.1-13, Metallic Outlet Boxes.

.2 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for TECK cable, flexible conduit, armoured cable, as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.

.2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

.2 The use of bushing stud connectors is not acceptable.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.3 Section 26 05 34 - Conduits, Conduit Fastenings, and Conduit Fittings.

.4 Section 26 05 43.01 - Installation of Cables in Trenches and Ducts.

1.2 PRODUCT DATA

.1 Provide product data in accordance with Section 26 05 00 - Common Work Results for Electrical.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: copper, stranded for #12 AWG and larger. Minimum size: #12 AWG.

.2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE Non Jacketed.

2.2 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90. Minimum size: #12 AWG.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: anti short connectors.

2.3 CONTROL CABLES

.1 Type: low energy 300 V control cable: solid annealed copper conductors sized as required or as indicated:

.1 Insulation: thermoplastic.

.2 Sheath: thermoplastic jacket.

.3 Shielding: metallized tapes over conductors.

2.4 TECK90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper.

.3 Size as indicated, minimum size: #12 AWG..

.3 Insulation:

.1 Cross-linked polyethylene XLPE.

.2 Rating: 600V.

.4 Armour: interlocking aluminum.

.1 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project, UV rated, suitable for use at -40 Degrees C.

.5 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables

.3 Threaded rods: 6 mm diameter to support suspended channels.

.6 Connectors:

.1 Watertight, approved for TECK cable.

2.5 SOLAR PHOTOVOLTAIC MODULE WIRING

.1 Comply with CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations, section 64.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Cables installed in trenches shall be type TECK90 cable.

.2 Cables connecting to devices located external to buildings, or where exposed to damp or wet conditions shall be type TECK90.

.3 Install cable in trenches in accordance with Section 26 05 43.01 - Installation of cables in Trenches and Ducts.

.4 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.5 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.6 Conductor length for parallel feeders to be identical.

.7 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.8 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Wiring from below and horizontal wiring in walls to be avoided unless indicated.

.9 Shared neutrals shall not be used in 2-wire branch circuit wiring for lighting, receptacles and permanently wired computer and electronic equipment.

.10 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.11 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed, securely supported by straps.

3.5 INSTALLATION OF ARMOURED CABLES

.1 AC-90 shall only be permitted for branch circuit wiring drops from ceiling junction boxes to light fixtures, receptacles and other equipment in the same room requiring electrical power. The installation of AC-90 cable for branch circuit wiring home runs or runs between rooms is not acceptable. Raceway and building wire shall be used for this purpose unless otherwise noted.

.2 AC-90 shall not be used where the cable remains exposed, following completion of construction, at any point between the finished floor level to a point 2m above finished floor.

.3 All AC-90 fixture or device feeds shall originate from the sides of outlet boxes and not from the box cover.

.4 Termination of AC90 cable is to utilize steel connections with accompanying lock nuts similar to or equal to T&B 3301 series.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

3.7 INSTALLATION OF SOLAR PHOTOVOLTAIC MODULE WIRING

.1 Comply with CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations, section 64.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).

.2 CSA C22.2 No.65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

.1 Long barrel Copper compression connectors to CSA C22.2 No.65 as required sized for conductors and according to application.

.1 Copper, two hole, long barrel (dual crimp) type lugs are to be used for all wire sizes #4 AWG and larger.

.2 One-hole short-barrel compression connectors to CSA C22.2 No.65 as required sized for conductors and according to application.

.1 Copper, one hole, short barrel (single crimp) type lugs are to be used for all wire sizes up to, and including #6 AWG.

2.2 INSTALLATION

.1 Install terminations in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2 No.41.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 05 22 - Connectors and Terminations

1.2 REFERENCE STANDARDS

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837-14, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Rod electrodes: 19mm diameter copper clad steel by minimum 3m long.

.3 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.4 Grounding and bonding conductors sized up to and including #10 AWG, are to have green coloured RW90 X-link insulation. Type TW75 complete with green coloured insulation is acceptable for all sizes #8 AWG and larger.

.5 Insulated grounding conductors: green, copper conductors, size as indicated.

.6 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Crimp type conductor connectors.

.4 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

.7 The use of U-bolt, split bolt, servit or similar connectors is not permitted.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints are not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.9 The main “incoming ground” conductor is to run unbroken to the main electrical service entrance overcurrent device ground bus.

.10 All cables, feeder and branch circuit conductors installed in conduit are to be complete with a separate minimum size #14 AWG copper bond/ground wire as follows:

- .1 Where bond wire sizes larger than #14 AWG are required, they are to be increased as required by Canadian Electrical Code Table 16, or as otherwise noted.
- .2 No.14 AWG and larger size ground or bond conductors shall be of soft drawn stranded copper of 98% conductivity, and of full size and AWG gauge.
- .3 Size of bonding conductor is to be based upon Table 16 of the Canadian Electrical Code.
- .4 Size of grounding conductor is to be based upon the Canadian Electrical Code.
- .5 Minimum size #14 AWG (solid) green insulated conductors are acceptable for bonding purposes associated with various other systems rated at 50 volts or less.

.11 The “feed” bonding conductor shall be secured (wrapped around unbroken) to the grounding screw of each outlet/device box, before connecting to the other grounding conductors, and/or providing a “pig-tail” lead for device terminations.

.12 All ground wires are to be twisted together with a screw-on type wire connector, and then placed in rear of outlet box in such manner as to minimize obstructions.

3.2 ELECTRODES

.1 Install rod electrodes and make grounding connections as indicated.

.2 Bond separate, multiple electrodes together.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.4 CONDUITS AND RACWAYS

.1 All conduit and EMT raceways for all electrical systems are to contain a minimum #14 AWG insulated copper bond wire. Bonding jumpers are permitted for conduit stubbed into a T-bar ceiling. All metallic conduit stubs shall be bonded regardless of length.

3.5 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Metallic

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 1 in. (25 mm) minimum extension all around.

.3 Covers Surface Mounted: screw-on turned edge covers.

.2 Non-metallic

.1 Construction: PVC.

.2 Covers: dual-moulded, screw-on cover, integral gasket

.3 Mounting: surface, with four integral moulded mounting feet

Part 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating circuit, voltage, or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 4 in. (102 mm) square or octagonal outlet boxes for lighting fixture outlets.

.2 Extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 CONDUIT BOXES

.1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.4 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18.1-13 Metallic Outlet Boxes.
- .2 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
- .4 CSA C22.2 No. 211.2-06(R2016), Rigid PVC (Unplasticized) Conduit.

Part 2 Products

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One-hole steel straps to secure surface conduits 35 mm and smaller.

- .1 Two-hole steel straps for conduits larger than 35 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Use of factory "ells" is not permitted.

.3 Watertight connectors and couplings for EMT.

- .1 Set-screws are not acceptable.

2.4 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in service rooms and in unfinished areas.

.3 Use electrical metallic tubing (EMT).

.4 Use rigid pvc conduit underground and in wet areas.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.

.6 Minimum conduit size for lighting and power circuits: 21 mm.

.7 Minimum conduit size for communications circuits: 16 mm.

.8 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.9 Mechanically bend steel conduit over 21 mm diameter.

.10 Install fish cord in empty conduits.

.11 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.12 Dry conduits out before installing wire.

.13 Flexible Conduit:

.1 Liquid-tight flexible conduit, not smaller than 21 mm shall be used for final connections to all vibrating and/or mechanical equipment, including various systems' controls and related devices.

.2 Steel type connectors are to be used on flexible type conduits. Malleable type connectors are not permitted.

.3 A bonding conductor shall be installed inside each length of flexible conduit and terminated at each end to ensure bonding continuity through the flexible conduit.

.14 EMT:

.1 Screw-on metal (malleable) type bushings are to be installed on all EMT connectors sized 1-¼ in. (35 mm) and larger. (To be installed prior to drawing-in conductors)

.2 EMT connectors sized 1 in. (27 mm) and smaller do not require insulated throats nor any types of screw-on type bushings.

.3 Rain-tight EMT connectors and couplings are to be used.

.4 EMT conduit stub is to be off-set out of wall into accessible ceiling space of room containing flush installed device box and have steel EMT connector complete with plastic or grounding type bushings screwed on same. EMT plastic end cap bushings that are CSA approved may also be used.

.5 All EMT conduit wall stubs and associated boxes are to be adequately bonded to ground as per CEC requirements.

.15 All various types of systems, including lighting and power, whose wiring is to be installed on any exposed types of surfaces are always to be completely installed in raceway as per the following guidelines:

.1 Use EMT conduit in unfinished areas.

.2 Use aesthetic type surface raceway in finished areas where it is impossible to conceal conduits.

.3 Ceiling mounted conduit/raceway is to be secured directly to overhead structure.

.4 Wall mounted conduit/raceway is to be secured directly to, or directly on, exposed walls.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on surface channels.

.4 Do not pass conduits through structural members except as indicated.

.5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

Part 2 Products

2.1 CABLE PROTECTION

.1 38 x 140 mm (trade size 2 in. x 6 in.) wood planks, pressure treated.

Part 3 Execution

3.1 DIRECT BURIAL OF CABLES

.1 Cables shall be buried to a depth (as measured from the top of the cable(s) to the surface of the land immediately surrounding the trench) that conforms with CSA 22.1-18 Table 53.

.2 Prepare the trench with a bed of sand with a minimum thickness (depth) of 75 mm.

.3 Lay cable(s) on the sand bed. Surround the cable(s) with 150 mm of sand above and on all sides of the cable(s).

.1 Do not pull cable into trench.

.4 Fill the trench with native material.

.1 Native materials shall not contain rocks greater than 50 mm in diameter for the first 300 mm above the sand bed.

.2 Compact the backfill every 300 mm of depth.

.5 Underground cable splices not acceptable.

.6 Cable separation:

.1 Maintain 75 mm minimum separation between cables of different circuits.

3.2 CABLE PROTECTION

.1 Install continuous row of pressure treated 38 x 140 mm wood planks to cover length of run.

.2 The wood planks shall be located 300 mm below the surface of the trench (as measured from the underside of the planks to the surface of the land immediately surrounding the trench).

.3 Install mesh-type, detectable, marker system on the wood planks to cover the entire length of the run. The mesh shall have the following minimum specifications:

.1 Colour: red.

.2 Central longitudinal cord to provide visible element indicating the presence of the buried hazard.

.3 Integrated stainless steel tracer wire, 0.8mm diameter, coated in black polypropylene. 1.3mm overall diameter.

.4 Mesh: five support elements,

.5 Exterior tapes: two, longitudinal.

.6 Overall width: 200mm minimum.

.7 Standard of acceptance: TechnoConsor Plyage HzD, or equivalent.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Acceptance Tests:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 500V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 05 28 - Grounding - Secondary

.3 Section 26 24 16.01 - Panelboards Breaker Type

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.29-15, Panelboards and Enclosed Panelboards.

Part 2 Products

2.1 EQUIPMENT

.1 Panelboard. Breaker type: in accordance with Section 26 24 16.01 - Panelboards Breaker Type, rating as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install service equipment.

.2 Connect to incoming service.

.3 Connect to outgoing load circuits.

.4 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 - Rough Carpentry.

.2 Section 26 05 00 - Common Work Results for Electrical.

.3 Section 26 28 16.02 - Moulded Case Circuit Breakers.

.4 CSA International

.1 CSA C22.2 No.29-15, Panelboards and Enclosed Panelboards.

.5 Institute of Electrical and Electronics Engineers

.1 IEEE C62.41-1991, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits

.2 IEEE C62.45-1987, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and less) AC Power Circuits

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250V panelboards: bus and breakers rated for 10 kAIc.

.3 Rated for service entrance duty.

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on the drawings.

.6 Minimum of 2 flush locks for each panel board.

.7 Two keys for each panelboard and key panelboards alike.

.8 Copper bus with neutral of same ampere rating of mains.

.9 Copper ground bus, isolated, extending full width and located at bottom.

.10 Mains: suitable for bolt-on breakers.

.11 Trim with concealed front bolts and hinges.

.12 Trim and door finish: baked enamel.

.13 Include bonding busbar with 3 terminals for bonding conductor equal to breaker capacity of the panel board.

.14 All devices, equipment, and systems must be capable of off-season storage in-place without supplemental heat, and without the need to "winterize" any item(s).

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.1 The manufacturer of the circuit breakers shall be the same as the manufacturer of the panelboard or switchboard.

.2 Breakers with thermal / magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for breakers installed as indicated.

.5 Lock-on devices for emergency and exit light circuits.

.6 Breakers shall be of a type such that the line-side of the breaker bolts to the panelboard's bus. All other types shall not be acceptable.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

2.4 ACCEPTABLE MANUFACTURERS

.1 Eaton.

.2 Schneider Electric.

.3 Siemens.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.

.3 Install surface mounted panelboards in stainless steel enclosures where indicated.

.4 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

.5 Connect loads to circuits.

.6 Connect neutral conductors to common neutral bus with respective neutral identified.

.7 Branch Circuit Panelboards (225A and smaller)

.1 Each branch circuit shall be clearly identified on a typewritten directory, with directory being protected by a clear plastic cover.

.2 Panelboards are to be complete with the following:

.1 Minimum of 10% spare 15 amp 1 pole circuit breakers.

.2 Minimum of 10% spare spaces for 1 pole circuit breakers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No.94.1, Enclosures for Electrical Equipment, Non Environment Considerations.

Part 2 Products

2.1 MATERIALS

.1 Enclosure constructed with 2.7 mm thick (minimum) steel, with weather and corrosion resistant finish to CAN/CSA C22.2, size as indicated, and where indicated on the drawings.

.2 Enclosure constructed with stainless steel, with corrosion resistant finish to CAN/CSA C22.2 size as required.

.3 Entire enclosure to be capable of withstanding maximum impact force of 86 MN/m^2 area without rupture of material.

.4 Removable enclosure panels with formed edges, galvanized steel external fasteners removable only from inside enclosure.

.5 Equip enclosure with hot dipped galvanized mounting rails adjustable horizontally and vertically to enable mounting of equipment at any location within housing.

.1 Rails: 14 mm holes and 50 x 14 mm slots on 100 mm centres for horizontal adjustment.

.2 Holes in side panel flanges in 60 mm increments for vertical adjustment.

.6 Cover: tamperproof, bolt-on, domed to shed water.

.7 Door: hinged, 3 point latching, with padlocking means.

Part 3 Execution

3.1 INSTALLATION

.1 Assemble enclosure in accordance with manufacturer's instructions and securely mount on building structure with channels, supports and fastenings.

.2 Mount equipment in enclosure.

.3 Label electrical cabinets and enclosure to Section 26 05 00 - Common Work Results for Electrical.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.42-10(R2015), General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CAN/CSA C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA C22.2 No.55-15, Special Use Switches.

.4 CSA C22.2 No.111-10(R2015), General-Use Snap Switches (Bi-national standard, with UL 20).

Part 2 Products

2.1 SWITCHES

.1 15 A, 120 V, single pole, double pole, three-way, four-way switches to CSA C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 Ivory toggle.

.3 Toggle operated, fully rated for tungsten filament, LED and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles to CSA C22.2 No.42:

.1 CSA type 5-20 R, 125 V, 20 A, U ground,

.2 Extra Heavy duty, spec grade.

.3 Standard of Acceptance: Hubbell No. HBL5362I.

.2 Ivory urea moulded housing.

.3 Suitable for No. 10 AWG for back and side wiring.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.6 Other receptacles with ampacity and voltage as indicated.

.7 GFCI receptacles as required.

.8 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

.1 Cover plates for wiring devices to CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Nylon ivory cover plates for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Heavy duty, weatherproof cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Cover plates from one manufacturer throughout project.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical.

.3 Pig-tail type leads are to be installed on conductors in all device or outlet boxes where feeding through to other receptacles. Daisy-chain or looping through of conductors from one device to another is not acceptable. Provide separate pig-tail conductor leads for final termination to each receptacle for phase, neutral and bond conductors.

.4 The use of GFCI receptacles as indicated.

.3 Cover plates:

.1 Install suitable common cover plates where wiring devices are grouped.

.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Six spare fuses of each type and size installed up to and including 600A.

Part 2 Products

2.1 FUSES - GENERAL

.1 Fuse type references J1, J2, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Class J fuses.

.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type J2, fast acting.

.2 Others.

.1 Other types of fuses as required by equipment manufacturer.

Part 3 Execution

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Deliver spare fuses to the Department Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 24 16.01 - Panelboards Breaker Type.

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No. 5-16, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 When installed in panelboards or switchboards, the manufacturer of the circuit breakers shall be the same as the manufacturer of the panelboard or switchboard.

.6 Each circuit breaker mounted in a switchboard shall be equipped with individual padlocking facility such that the circuit breaker may be locked in the open position and may not be moved to the closed position while the padlock is in place.

.7 All devices, equipment, and systems must be capable of off-season storage in-place without supplemental heat, and without the need to “winterize” any item(s).

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 OPTIONAL FEATURES

.1 Include:

.1 On-off locking device.

.2 Handle mechanism.

2.4 ACCEPTABLE MANUFACTURERS

.1 Eaton.

.2 Schneider Electric.

.3 Siemens.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2 No.4-16, Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).

.2 CSA C22.2 No.39-13, Fuseholder Assemblies.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Horsepower rated, Non-fusible, Fusible, disconnect switch in CSA enclosure as indicated.

.2 Provision for padlocking in on-off switch position by 3 locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01- Fuses - Low Voltage.

.5 Fuseholders: to CSA C22.2 No.39, relocatable and suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.1 SOLAR PHOTOVOLTAIC SYSTEM DISCONNECT SWITCHES

.1 Comply with CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations, section 64.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

2.3 ACCEPTABLE MANUFACTURERS

.1 Eaton.

.2 Schneider Electric.

.3 Siemens.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 05 21 - Wires and Cables (0-1000 V).

.3 Section 26 05 22 - Connectors and Terminations.

.4 Section 26 05 28 - Grounding – Secondary.

.5 Section 26 28 23 - Disconnect Switches - Fused and Non-Fused.

.6 Section 26 33 16 - Batteries and Battery Racks.

.7 Section 26 33 43 - Battery Chargers.

1.2 REFERENCE STANDARDS

.1 International Electrotechnical Commission

.1 IEC 61215 2016, Terrestrial photovoltaic (PV) modules.

.2 IEC 61701 2011, Salt mist corrosion testing of photovoltaic (PV) modules.

.3 IEC 62548 2016, Photovoltaic (PV) arrays – Design Requirements.

1.3 PRODUCT DATA

.1 Provide product data in accordance with Section 26 05 00 - Common Work Results for Electrical.

Part 2 Design and Performance Requirements

2.1 GENERAL

.1 The Contractor shall evaluate, design, supply, install, test and commission a renewable energy solar photovoltaic system to supply the electrical loads located at the site. This shall include all civil, structural, electrical and mechanical devices, equipment, services and systems to support the solar photovoltaic system.

2.2 PERFORMANCE REQUIREMENTS

.1 The renewable energy solar photovoltaic system and associated components shall be designed and built to produce:

.1 A minimum 7 kWh (average daily consumption), refer also to the drawings for the most current data.

.2 A peak load of 4 kW, refer also to the drawings for the most current data.

.3 An ac system voltage of 120/240 VAC, 60 Hz, 1-phase 3-wire, grounded.

.4 A dc system voltage of 48 VDC.

.2 The forecasted energy production is to be shown in PVSyst using as-built conditions and typical mean year meteorological data for Cheticamp, Nova Scotia. The final energy production forecast is to use actual design parameters, calculated losses, and specifications of the installed equipment.

.3 The system shall operate isolated from any utility source.

2.3 DESIGN REQUIREMENTS

.1 The design shall meet the Nova Scotia Building Code.

.2 The solar module configuration and orientation shall be optimized for energy production over the course of the operating season from 1 May to 31 October. Maximum incident solar radiation shall be assumed to occur for 3.5 hours each day during that period. Selection of solar module technology shall be based on the optimum cost effective solution considering construction costs, energy output and operating costs.

.3 The separation between rows of solar modules and any obstructions that may place the solar modules in shadow shall be a minimum of 1.75m. The contractor shall confirm that the separation is adequate to provide full solar illumination of the solar modules, and shall supply supporting documentation. Calculations shall be based upon the following:

.1 Geographic location: 46.63427 degrees N, -61.00918 degrees E, sea level.

.2 Full solar illumination of the solar modules (zero shadowing) between 2 hours before and 2 hours after peak solar altitude from the period 1 May to 31 October.

.3 Solar module tilt of 45 degrees from the horizontal.

.4 Solar modules aligned to face 195 degrees (azimuth) from true (geodetic) north.

.5 Solar module dimensions of 2m long and 1m wide, arranged such that the solar modules are mounted with the longest side in a horizontal orientation.

.4 All devices, systems, and equipment must function satisfactorily during the operating season, and, when not in operation, out-of-season under the environmental conditions that are present at the site and that may reasonably be expected to be encountered at the site. This shall include allowances for the proximity to a marine environment, and Les-Suetes winds. The contractor is advised to consult Environment Canada to determine the magnitude, direction, duration and frequency of the winds to ensure that the systems and their support structures will meet the design, performance and warranty requirements.

.5 All devices, equipment, and systems must be capable of off-season storage in-place without supplemental heat, and without the need to “winterize” any item(s). Devices shall be selected to give priority to long life as stated in Part 3 WARRANTY.

.6 The solar modules shall be located clear of paths, walkways, roadways, vegetation, and similar obstructions. The solar modules shall be located such that the angle measured from the lowest point on the active (energy gathering) face of any solar module to the top of any obstruction shall not be greater than 22 degrees measured from the horizontal.

.7 Access to the batteries, inverters, concentrators, controllers, and all associated equipment by unauthorized persons shall be prevented at all times by the use of fencing with locked gates, or locked buildings. Such methods of access control shall comply with the Canadian Electrical Code and bulletins issued by the authority having jurisdiction.

.8 The renewable energy solar photovoltaic system shall include lightning surge arrestors as additional protection in the inverters.

.9 The nominal loads that are to be supplied from the renewable energy solar photovoltaic system are listed on the drawings. The contractor shall coordinate with suppliers, vendors and other trades to revise the equipment load specifications and supply voltage requirements to ensure that the equipment selected will be supported by the renewable energy solar photovoltaic system.

.10 A maximum DC average voltage drop of 1%; inclusive of string PV source circuits and PV output circuits. DC Voltage Drop = Average PV Source Circuit Voltage Drop + Average PV Output Circuit Voltage Drop.

.11 A maximum AC average voltage drop of 1.5%; inclusive of all AC cables. AC Voltage Drop = Average Inverter Cable Voltage Drop + Average Sub Panel Cable Voltage Drop + Average Transformer Cable Voltage Drop.

.12 The renewable energy solar photovoltaic system shall be capable of supplying the loads continuously for up to 72 hours without solar input.

.13 Storage batteries shall not discharge below 50% of nominal ampere-hour capacity.

.14 The contractor shall coordinate with structural and architectural trades professionals to ensure that the buildings and structures are capable of safely supporting and containing the solar panels, batteries, chargers, inverters, and other devices, systems and equipment, and for all environmental conditions as noted.

Part 3 Products and Execution

3.1 EQUIPMENT REQUIREMENTS

.1 All equipment shall be CSA certified, or certified by a testing laboratory acceptable to the province of Nova Scotia. The use of the CSA Special Inspection service to certify equipment will not be acceptable.

.2 Warranty. The warranty period shall commence from the date of substantial performance.

.1 Installation workmanship: 2 years.

.2 Solar module: 25 years performance rating: 10 years.

.3 Off-grid inverter/charge/controller: 10 years

.4 Battery: 5 years, not pro-rated.

.5 Solar module supports and racking: 20 years

.6 Battery racking and supports: 10 years.

.3 Solar Module: Application class “A” or “C”. Minimum module power rating of 335W STC. Polycrystalline. Passive Emitter Rear Contact (PERC) technology optional. Standard of acceptance: Canadian Solar, or equivalent.

.4 Inverter/charger/controller. Minimum 98% CEC efficiency. Bankable. Pure sine wave inverter. Include arc fault circuit interrupter. Indoor, lockable general-purpose CSA 1 enclosure. Standard of acceptance: Outback Power or equivalent.

.5 Solar module supports and racking – ground mounted: Penetrating non-ballasted. Rust proof. Wind tunnel tested. Permits water to flow underneath. Includes protective padding under the racking. Includes ballast design and equipment load drawings. Standard of acceptance: Schletter or equivalent.

.6 Combiner boxes, disconnects, junction boxes and sub-panels. Steel. Indoor (NEMA/CSA 12, dust-tight) or outdoor (NEMA/CSA 4X, water-tight for corrosive atmospheres) rated according to location.

.7 Battery.

.1 Flooded deep cycle battery suitable for renewable energy applications.

.2 Cell voltage: 6V.

.3 Capacity: nominal 893 Ah (20-hour discharge rate).

.4 Mounting: rack mountable.

.5 Nominal battery voltage at full charge: 6 Volts

.6 Battery to deliver specified output in ambient temperature from -5 degrees C to +40 degrees C.

.7 Standard of acceptance: Rolls Deep Cycle type 6 CS 27P or equivalent.

.8 Conductors: sun resistant and not placed in continuous direct sunlight.

.9 Connectors: Use components of one manufacturer throughout.

3.2 EXECUTION

.1 The contractor is to carry-out the final design, procurement, installation, and commissioning of the renewable energy solar photovoltaic system.

.2 Examine areas and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work. Proceed with installation only after unsatisfactory conditions have been corrected.

.3 Examine area to verify actual locations of equipment, cable lengths and routing before equipment installation.

.4 Install the renewable energy solar photovoltaic system in the approximate locations shown on the drawings and in conjunction with the Departmental Representative's representative. Ground-mounted solar arrays shall be aimed and aligned to suit site conditions and the design parameters for optimum energy collection.

.5 Install all equipment per manufacturers' manuals and instructions.

.6 Install the renewable energy solar photovoltaic system support systems, combiner boxes, disconnects, batteries, battery racks, inverters, controllers, chargers, conductors, cables and other devices in the approximate location shown on the drawing.

.7 Install all solar panels and complete panel to panel interconnection in series using panel manufacturer approved connectors, providing jumper cables and connectors when required.

.8 Place string cables behind the solar panels. Coil the excess cable. Secure the cable to the metal frame racking with heavy-duty sunlight resistant zip tie or approved clips at 80cm spacing.

.9 All conductors should be mechanically protected, fastened, and routed professionally with cable management fasteners. Conductors should be kept clear of sharp edges and roofing material.

.10 Do not use metallic LB, LL or LR fittings. Provide goose neck bends where possible.

.11 Do not exceed the minimum bending radius of the cables.

.12 Provide weather resistant labeling for all string wiring, at both ends, installed between the array and the harness, UV resistant if exposed to the sun.

.13 Install complete DC system grounding, including panels, racking systems, combiner boxes as per CSA requirements, local electrical code, and manufacturer specifications.

.14 Install complete AC system grounding as per single line diagrams, CSA requirements, local electrical code, and manufacturer specifications.

.15 Install the AC power distribution panelboard and grounding electrodes in the approximate location shown on the drawing.

.16 The use of overhead power distribution conductors will not be permitted.

.17 Provide weather resistant labeling and signage as per code requirements and the requirements of the authority having jurisdiction.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Service. Engage and pay for a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

.2 Perform tests and inspections with the assistance of a factory-authorized service representative.

.3 Submit legible red-lines of construction drawings in Adobe Acrobat™ PDF format upon completion of construction, highlighting changes.

.4 Renewable energy solar photovoltaic system equipment will be considered defective if it does not pass tests and inspections.

.5 Prepare written test and inspection reports and submit to the Departmental Representative's representative.

3.4 STARTUP, COMMISSIONING AND TRAINING SERVICES

.1 Engage and pay for a factory-authorized service representative to perform startup services. Complete installation and startup checks per manufacturer's written instructions.

.2 Engage and pay for a factory-authorized service representative to provide training on the system, including first-level diagnostic and trouble-shooting practices.

.3 Submit drawings, equipment warranties and manuals in a binder to the Departmental Representative. Submit three printed copies.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 78 00 - Closeout Submittals.

.2 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 American Petroleum Institute (API)

.1 API Std. 650, Welded Steel Tanks for Oil Storage 11th Edition.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA MG1, Motors and Generators.

.3 Canadian Environmental Protection Act (CEPA)

.1 CCME PN 1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.

.4 CSA International

.1 CSA-B139-09 (R2014), Installation Code for Oil Burning Equipment.

.2 CSA C22.2 No.100-14, Motors and Generators.

.5 International Organization for Standardization (ISO)

.1 ISO 3046-1, Reciprocating Internal Combustion Engines - Performance - Part 1: Declarations of Power, Fuel and Lubricating Oil Consumptions, and Test Methods - Additional requirements for engines for general use.

.6 National Research Council Canada (NRC)

.1 National Fire Code of Canada.

.7 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Refer to Section 26 05 00 - Common Work Results for Electrical. Make all submissions in accordance with Section 26 05 00.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and data sheets for power generators and load banks, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Concrete pad recommendations (dimensions, reinforcement, concrete strength specification), layout and stub-up locations for generator pad and load bank pad.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Nova Scotia, Canada, and include:

- .1 Dimensioned drawing of set including engine, alternator, control cubicle, exhaust system, fuel system, load bank and accessories.
- .2 Generator engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, fuel consumption, etc.
- .3 Line diagram showing alternator, control cubicle, voltage regulator, battery, battery charger, governor specifications.
- .4 Diagram for automatic engine ventilation.
- .5 Flow diagrams for:
  - .1 Fuel.
  - .2 Lubricating oil.
  - .3 Cooling air.
- .6 Continuous full load output at 0.8 power factor lagging.
- .7 Type and make of governor.
- .8 Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
- .9 Generator resistances, reactances and time constants.
- .10 Generator locked rotor motor starting curves.
- .11 Manufacturer's documentation showing maximum expected transient voltage and frequency dips, and recovery time during operation of the generator set at the specified site conditions with the specified loads.
- .12 Cooling air requirements in m^3/s.
- .13 British standard or DIN rating of engine.
- .14 Generator set operation:
  - .1 Automatic starting, transfer to load, and shut down.
  - .2 Manual starting.
  - .3 Automatic shut down on over cranking, overspeed, high engine temperature, low lube oil pressure, short circuit and alternator over voltage.
- .15 Manufacturer's and dealer's written warranty.
  - .1 The engine-generator supplier shall maintain 24-hour parts and service capability within 150 km of the project site. The distributor shall stock parts as needed to support the generator set package for this specific project. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24hrs and 95% within 48 hours.

1.4 CLOSEOUT SUBMITTALS

.1 Refer to Section 26 05 00 - Common Work Results for Electrical. Make all submissions in accordance with Section 26 05 00.

.2 Operation and maintenance instructions for engine, alternator, control panel, fuel system, load bank and accessories to permit effective operation, maintenance and repair.

.3 Technical data:

.1 Illustrated parts lists with parts numbers.

.2 Schematic diagram of electrical controls

.3 Flow diagrams for fuel, lube oil and cooling air.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

1.6 EXTRA MATERIALS

.1 Extra Material/Spare Parts; provide the following:

.1 Two fuel filter elements for each type of fuel filter/water separator.

.2 Two lubricating oil filter elements.

.3 Two air cleaner elements.

.2 Provide conclusive evidence that Canadian distributor has been established and will stock in Canada spare parts likely to be required during normal life of engine.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 The work includes supplying and installing a complete integrated generator system. The system consists of a diesel generator set with related component accessories, generator exhaust system, generator set enclosure, and load bank.

.2 Generator system consists of:

.1 Engine.

.2 Alternator.

.3 Control cubicle.

.4 Battery and engine-driven battery charger.

.5 Automatic ventilation equipment.

.6 Fuel supply system.

.7 Engine exhaust system with silencer/muffler and insulation.

.8 Antifreeze, ethylene glycol.

.9 Dual-wall fuel tank in base.

.10 Fuel storage tank initial fill, plus top-up after testing.

.11 Corrosion-free weather proof sound attenuating enclosure.

.12 Mounting base.

.13 Load bank.

.3 Set designed and rated for prime-power service to operate unattended in remote location for the duration of the site's operating season.

.4 All devices, equipment, and systems must be capable of off-season storage in-place without supplemental heat, and without the need to "winterize" any item(s).

2.2 GENERATING SET

.1 Capacity:

.1 Total output of engine in hp (brake) = British standard rating as defined to ISO 3046-1 expressed in hp (brake), minus the sum of the following:

.1 Power to drive cooling fan.

.2 Power loss for site conditions.

.2 Site conditions; derate for:

.1 Proximity to maritime environment.

.2 Ambient temp:

.1 Operating season: minus 15 degrees C to plus 40 degrees C.

.2 Storage season: minus 30 degrees C to plus 20 degrees C.

.3 Altitude: 30 m.

.3 Generator rating in kW x 1.34 divided by generator efficiency.

.4 Generator rating:

.1 The generator set shall be Prime Duty rated at 45 ekW, 45.0 kVA, 1800 RPM, 1.0 power factor, 240 V, Single Phase, 60 hertz, including radiator fan and all parasitic loads.

.2 Load: Varying

.3 Typical Hours/Year: Unlimited

.4 Typical Peak Demand = 100% of prime rated ekW with 10% overload capability for emergency use for a maximum of one (1) hour in 12. Overload operation cannot exceed 25 hours per year.

.2 Engine: to ISO 3046-1, diesel fuel, operating speed 1800 rpm, air or liquid cooled:

.1 Air cooled: pressure cooled with engine driven direct drive blower.

.2 Liquid cooled: radiator with engine driven fan and ethylene glycol anti-freeze non-sludging above minus 46 degrees C.

.3 Starting system:

.1 12 V dc motor, remote control, 12 V storage battery of sufficient capacity to crank engine for 3 min at minus 15 degrees C without using more than 25% battery capacity.

.4 Governor:

.1 Mechanical hydraulic with:

.1 Steady state speed band of +/-0.5%.

.2 Speed regulation no load to full load 5% maximum.

.2 Electronic type, electric actuator, speed droop externally adjustable from isochronous to 5%, temperature compensated with steady state speed maintenance capability of +/-0.25%.

.5 Shock mounted engine instrument panel with:

.1 Lube oil pressure gauge.

.2 Lube oil temperature gauge.

.6 Fuel rack solenoid energized when engine running.

.3 Alternator: to NEMA MG1, single bearing, revolving field, coupled to engine by means of semi-flexible coupling and SAE housing, drip proof, amortisseur windings, synchronous type, class F insulation with:

.1 Brushless exciter, direct driven.

.2 Voltage regulator. The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 1% for any constant load between no load and full load. The regulator shall be a solid-state design, which includes electronic voltage buildup, volts per Hertz regulation, over-excitation protection, shall limit voltage overshoot on startup, and shall be environmentally sealed.

.3 Output:

.1 120/240VAC, 1-phase, 3-wire.

.2 Floating neutral.

.3 150% full load for 1 min.

.4 110% full load for 1 hour.

.5 100% full load continuously at 40 degrees C ambient.

.4 Circuit breaker. Provide a single, generator mounted circuit breaker, moulded case, 2-pole, breaker. Breaker shall utilize a solid state trip unit. The breaker shall be UL/CSA Listed, and connected to engine/generator safety shutdowns. Breaker shall be housed in an extension terminal box which is isolated from vibrations induced by the generator set. Mechanical type lugs, sized for the circuit breaker feeders shown on drawing, shall be supplied on the load side of breaker.

.4 Include materials as follows:

.1 Conduits and boxes as required.

.2 Electrical components as indicated.

.3 Wiring material.

.4 The power circuit cables will be copper, RW90 (minus 40 degrees C) cross link polyethylene, single conductor.

.5 Battery cable shall be welding cable type, extra flexible, rope stranded copper conductor with neoprene oil-resistant insulation, sized to limit voltage drop to 5% at time of peak load.

2.3 GENERATOR CONTROL PANEL

.1 Totally enclosed.

.2 Panel door with formed edges and lockable handle with 2 keys.

.3 Flexible conductors between door and fixed panel.

.4 Instruments: ac ammeter and voltmeter with selector switches, frequency meter, engine running time meter, with miniature glass fast acting fuses for indicating instruments fitted at rear of instrument.

.5 Controls:

.1 Engine start and emergency stop buttons, test button, alternator output moulded case circuit breaker, program selector switch, power transfer switch, voltage control rheostat, "normal power" and "emergency power" pilot lights.

.6 Automatic shut-down and alarms:

.1 Engine overcrank, overspeed, high temp, low lube oil pressure, short circuit, low battery voltage to alarm only, and alternator overvoltage.

.2 Alarms to be illuminated annunciator, manual reset and set of NC/NO contacts be provided wired to terminal block for future connection to remote annunciator.

2.4 GENERATING SET OPERATION

.1 Program selector switch set at "Automatic".

.1 Provision for future input from future transfer switch.

.2 Program Selector Switch set at "Manual"

.1 Start button controls engine.

.3 Program selector switch set at "OFF".

.1 Running engine stops.

.2 Stopped engine will not start.

.3 Switch lockable in this position.

2.5 GENERATOR EXHAUST SYSTEM

.1 A heavy duty, critical grade silencer, companion flanges, and flexible stainless steel exhaust fitting properly sized with condensate drain plug shall be furnished and installed according to the manufacturer's recommendation. Mounting shall be provided by the contractor as shown on the drawings. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer.

.2 Heavy duty flexible exhaust hose with flanged couplings.

.3 Expansion joints, stainless steel, corrugated, of suitable length to absorb both vertical and horizontal expansion.

2.6 GENERATOR ENCLOSURE

.1 Weatherproof enclosure suitable for prolonged exposure to a marine environment.

.2 Low-flammability fire resistant material.

.3 Corrosion free suitable for proximity to a maritime environment.

.4 Ready access to internal components by hinged/removable lockable doors/covers.

.5 Viewports in enclosure to essential systems.

.6 Sound attenuation: maximum permissible noise level of 50 dB(A) at 7 metres (23 feet) from exterior surface.

2.7 GENERATOR FUEL SYSTEM

.1 Dual-wall fuel tank: in base. Capacity: minimum 72-hour at 100% of rated electrical load.

.2 Fuel level gauge integral and vent alarm.

.3 Drain and end plug.

.4 Copper feed and return lines with flexible terminations at engine, shut-off cock renewable cartridge filter and fire valve.

.5 Isolating valves on fuel lines serving auxiliaries.

.6 Electrically driven fuel transfer pump.

.7 Fuel level switch.

.8 Provide fuel for testing and leave full tanks on acceptance.

2.8 LOAD BANK

.1 Type: Permanent outdoor installation

.2 Enclosure: weatherproof enclosure suitable for prolonged exposure to a marine environment.

.3 Voltage: 240VAC 60HZ 1-phase.

.4 Load type: resistive.

.5 Rating: 6 kW continuous, 1.0 pf.

.6 Wiring: 150 degree C insulation. Terminal block for termination of customer's wiring.

.7 Ventilation: natural or forced mechanical (fan).

2.9 GENERATOR COOLING AIR SYSTEM

.1 Engine ventilating system:

.1 Recirculating damper assembly with modulating motor.

.2 Cold air inlet damper assembly with modulating motor.

.3 Air intake and discharge gooseneck weather hoods.

.4 Modulating thermostat, and replaceable intake air filters.

2.10 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Controls: size 4 nameplates.

.3 Meters, alarms, indicating lights: size 2 nameplates.

2.11 SOURCE QUALITY CONTROL

.1 Complete generator set factory tested.

.2 Generator Tests:

.1 Test at 100% rated load.

.2 Test at 110% rated load.

.3 Automatic shut down devices on trouble alarms.

.4 Automatic start-up, transfer to loads back to normal power and shutdown.

.5 Battery charger's ability to revert to high rate charge after cranking.

.3 Submit certified copy of test results to Departmental Representative before shipment to site.

Part 3 Execution

3.1 INSTALLATION

.1 Position generating set and install as indicated.

.2 Position load bank and install as indicated.

.3 Install fuel supply as indicated in accordance with CSA-B139.

.4 Install ventilating air dampers, ducts, hoods, enclosure, filters and fittings, exhaust system and muffler as indicated or as instructed by manufacturer.

.5 Complete wiring and interconnections as indicated.

.6 Start generating set and test to ensure proper performance.

.7 Energize load bank to ensure proper performance.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Preparation: before starting generator unit, carry out thorough mechanical and electrical inspection of equipment, and perform following checks and adjustments in accordance with manufacturer’s instructions.

.3 For wet batteries, inspect individually each battery cell and check electrolyte level.

.1 Check charge condition by measuring temperature and specific gravity of electrolyte.

.2 Consult manufacturer's instructions for recommended readings.

.3 If readings are lower, give batteries freshening charge until readings are reached.

.4 Notify Departmental Representative 10 working days in advance of test date.

.5 Demonstrate:

.1 Manual start and shut down.

.2 Operation of automatic shut-down devices and alarms.

.3 Operation (load) of load bank.

.6 Run generator and load bank on load for 2 hours.

3.3 MAINTENANCE - CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and CSA-B139.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 31 00 - Solar PV

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 Institute of Electrical and Electronic Engineers (IEEE)

.1 IEEE 484-2002, IEEE Recommended Practices for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications.

.2 IEEE 485-2010, IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications.

.3 IEEE 450-2010, Recommended Practice for Maintenance, Testing and Replacement of Vented Lead-Acid Batteries for Stationary Applications.

.3 Underwriters Laboratories Inc. (UL)

.1 UL 94-15, Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.3 PRODUCT DATA

.1 Provide product data in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Submit two copies of WHMIS MSDS to the departmental representative.

.3 Shop Drawings:

.1 Dimensioned sketch showing battery rack, individual battery cells, recommended aisle space, headroom, assembly and anchoring of rack.

.2 Individual battery cells, type, size, Ah capacity.

.3 Specific gravity at full charge and 25 degrees C.

.4 Cell charge and discharge curves of voltage, current, time and capacity.

.5 Derating factor for temperature range (-10 degrees C to -30 degrees C).

.6 Maximum short circuit current.

.7 Maximum charging current recommended for fully discharged condition.

.8 Full charge voltage per cell.

.9 Fully discharged voltage per cell.

.10 Hydrogen generation and ventilation requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for storage batteries and racks for incorporation into manual.

- .1 Operation and maintenance instructions concerning component functions and maintenance requirements to permit effective operation, maintenance and repair.
- .2 Installation details of battery rack, individual cells, inter-cell connectors.
- .3 Replacement instructions for individual cells.
- .4 Electrolyte handling.
- .5 Parts lists with catalogue numbers and names and addresses of suppliers.
- .6 Factory test records.

Part 2 Products

2.1 MATERIALS

.1 Steel for battery racks: to CSA G40.20.

2.2 BATTERY CHARACTERISTICS

.1 Refer also to 26 31 00 - Solar PV.

2.3 LEAD ACID BATTERIES

.1 Type: flooded electrolyte, Valve Regulated Lead Acid (VRLA), deep cycle, suitable for renewable energy applications.

.2 Electrolyte: solution of sulphuric acid, specific gravity 1.280

.3 Cell containers: polypropylene.

.4 Electrolyte level lines: high and low on container surfaces, visible from front of rack.

.5 Cover: one piece molded plastic, flame retardant to UL 94.

.6 Posts: bolted type.

.7 Cells: of identical construction and from same production run.

.8 Batteries: in clean state with no evidence of electrolyte on outside of cell containers.

.9 All devices, equipment, and systems must be capable of off-season storage in-place without supplemental heat, and without the need to “winterize” any item(s).

2.4 ACCESSORIES

.1 Accessories: self- adhesive numbers for cell identification, no-oxide grease, plastic topping-up bottle, 1000 cc, hydrometer holder with wall mount brackets, hydrometer.

.2 2 spare intercell connectors, nuts and bolts.

.3 2 spare inter-tier connectors, nuts and bolts.

2.5 BATTERY RACK

.1 100 mm above floor. Top of battery cells on highest tier not more than 2.5 m above floor.

.2 Frames: steel channels.

.3 Rails: steel channels, bolted to frames.

.4 Plastic strips to insulate rails from cells.

.5 Insulated from ground and floor.

.6 Free standing - not bolted to floor.

.7 Primed and epoxy painted to prevent corrosion.

.8 Corrosion resistant bolts and hardware.

.9 Configuration permitting any one cell to be removed without removing any other cell.

2.6 SOURCE QUALITY CONTROL

.1 Complete battery factory tested.

.2 Submit written copy of test results to Departmental Representative.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and erect battery rack.

.2 Install battery cells on rack.

.3 Clean posts and connectors and apply no-oxide grease.

.4 Install inter-cell and inter-tier connectors, and hand tighten nuts in accordance with manufacturer's instructions.

.5 Using torque wrenches, tighten nuts in accordance with manufacturer's recommended value.

.6 Connect battery to load circuit.

3.2 FIELD QUALITY CONTROL

.1 Check battery voltage and specific gravity of each cell in accordance with manufacturer's instructions.

.2 Float charge battery for 24 hours.

.3 Discharge battery at rated load for 72 hours.

.4 Check battery voltage at terminals, and specific gravity of each cell.

.5 Recharge battery to full charge.

.6 Check battery voltage and specific gravity of each cell.

.7 Leave battery in fully charged state.

.8 At end of tests, with battery in fully charged condition, operate charger on "float" for minimum period of 24 hours to ensure stable condition is reached and held.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 33 16 - Batteries and Battery Racks.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No.107.2-R2016, Battery Chargers.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Automatically maintain battery in fully charged state while input (solar) power available. Maintain DC float voltage within plus or minus 1% of setting.

.2 Manual adjustment of float charge voltage with range plus or minus 5%.

.3 Manual adjustment of equalizing charge voltage.

.4 Automatic current limiting adjustable between 80 and 120% of normal rating.

.5 Audible noise level not to exceed 65 dBA at 1.5 m.

.6 All devices, equipment, and systems must be capable of off-season storage in-place without supplemental heat, and without the need to “winterize” any item(s).

2.2 CHARGER CHARACTERISTICS

.1 Battery charger: to CAN/CSA C22.2 No.107.2.

.2 Operation in conjunction with inverter.

2.3 ACCESSORIES

.1 DC voltmeter: switchboard type, accuracy plus or minus 2% of full scale, to measure rectifier output voltage.

.2 DC ammeter: switchboard type, accuracy plus or minus 2% of full scale, to measure rectifier output current.

.3 LEDs mounted on front to indicate: low DC voltage, high DC voltage.

.4 Temperature compensation system for voltage output, including remote, battery mounted, temperature sensor.

2.4 ENCLOSURE

.1 Access from front.

.2 Convection ventilated.

.3 Meters, indicating lamps and controls group mounted on front panel.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Use size 4 nameplates for major components such as input breakers, output breaker.

.3 Use size 2 nameplates for mode lights alarms, meters.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install battery charger as indicated.

.2 Connect input terminals to source.

.3 Connect output terminals to battery.

3.2 TESTS

.1 In accordance with Section 26 33 16 Batteries and Battery Racks.

.2 Continue charging to ensure charger changes from bulk rate to float charge rate.

.3 Simulate faults to demonstrate that alarm lights and audible alarms are performing as designed.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.2 ASTM International Inc.

.1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.3 Canadian Standards Association (CSA International)

.4 Underwriters' Laboratories of Canada (ULC)

Part 2 Products

2.1 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.2 LUMINAIRES

.1 As indicated in luminaire schedule.

.2 Luminaire power supplies (drivers/ballasts) shall have a THD not exceeding 20%.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.2 Each light fixture is to have a separate fixture drop installed and connected to hard wired junction or outlet box located in ceiling/roof space.

.3 A maximum of four drops is permitted from any single box, regardless of box size.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

.1 ASTM International Inc.

.1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.2 Canadian Standards Association (CSA International)

.3 Underwriters' Laboratories of Canada (ULC)

Part 2 Products

2.1 LUMINAIRES

.1 As indicated in luminaire schedule.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated. Install fixture true and plumb, in accordance with manufacturer's instructions.

.2 Provide adequate support to suit site conditions.

.3 Check luminaire orientation, level and tilt.

.4 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C83-96 (R2016), Communication and Power Line Hardware.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, cabinets, conduits, pull boxes, sleeves and caps, fish wires, service poles, and service fittings.

2.2 MATERIAL

.1 Conduits.

.2 Junction boxes.

.3 Outlet boxes.

.4 Fish wire: polypropylene type.

Part 3 Execution

3.1 INSTALLATION

.1 Install empty raceway system, including distribution system, fish wire, terminal cabinets, outlet boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 56 20 - Erosion Protection and Sediment Control.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 14 13 – Soil Stripping and Stockpiling.

1.2 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps, roots, boulders and rock fragments to not less than specified depth below existing ground surface.

1.3 SAFETY

.1 Safety Requirements: worker protection.

.1 Workers must wear gloves, dust masks, long sleeved clothing, and eye protection when applying herbicide materials.

.2 Workers must not eat, drink or smoke while applying herbicide material.

.3 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.4 STORAGE AND PROTECTION

.1 Prevent damage to trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utilities, and other site appurtenances which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

1.5 WASTE MANAGEMENT

.1 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

.1 Stockpile adjacent to site.

Part 2 Products

2.1 MATERIALS

.1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

.2 Herbicide: effective for killing annual and perennial weeds, and bamboo grass, by being absorbed through roots and foliage as approved by Departmental Representative.

.3 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reuse.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

.1 Provide temporary erosion and sediment control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.

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

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

3.2 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utilities: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utilities are encountered.

.2 When utilities which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing.

.4 Keep roads and walks free of dirt and debris.

3.3 CLEARING

.1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.

.2 Clear as directed by Departmental Representative by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

.5 Apply herbicide in accordance with manufacturer's label to top surface of stumps designated not to be removed.

3.4 CLOSE CUT CLEARING

.1 Close cut clearing to ground level to within 100 mm of ground surface.

.2 Perform close cut clearing by hand so that existing muskeg is not damaged.

.3 Cut off branches overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 ISOLATED TREES

.1 Cut off isolated trees as directed by Departmental Representative at height of not more than 300 mm above ground surface.

.2 Grub out isolated tree stumps.

.3 Prune individual trees as indicated.

.4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.

.5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

.6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.6 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated to ground level.

3.7 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^3.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform to existing adjacent surface of ground.

3.8 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials to disposal area designated by Departmental Representative.

.2 Cut timber greater than 125 mm diameter to 3600 mm lengths and stockpile. Stockpiled timber becomes property of Departmental Representative.

.3 Dispose of cleared and grubbed materials by burying to approval of Departmental Representative.

.4 Chip, mulch and spread cleared and grubbed vegetative material on site as directed by Departmental Representative.

.5 Remove diseased trees and dispose to approval of Departmental Representative.

3.9 FINISHED SURFACE

.1 Leave ground surface in condition suitable for stripping of topsoil to approval of Departmental Representative.

3.10 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 01 56 20 - Erosion Protection and Sediment Control.

.2 Section 01 74 11 - Cleaning.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

.1 Provide temporary erosion and sediment control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.

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

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

3.2 STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable Provincial 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 composting.

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

.6 Strip topsoil to depths as indicated.

.1 Avoid mixing topsoil with subsoil.

.7 Pile topsoil in berms in locations as directed by Departmental Representative.

.1 Stockpile height not to exceed 2.5 - 3 m.

.8 Dispose of unused topsoil in location as indicated by Departmental Representative.

.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 Verify that grades are correct and notify Departmental Representative if discrepancies are present.

.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 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.

.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 SUB-SOILING

.1 Apply sub-soil, following spreading and cultivating procedures to designated areas to improve drainage and agricultural potential of soil.

.2 Work sub-soil area following natural grade contour lines, with vibrating sub-soiler to depth of 40 cm.

.3 Cross sub-soil the area following the first pass.

.4 Cultivate the soil with a chain harrow to de-clod the soil.

3.6 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 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 31 14 13 – Soil Stripping and Stockpiling.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m^3).

.6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 Nova Scotia Transportation and Infrastructure Renewal (NSTIR) Standard Specification for Highway Construction and Maintenance, 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 1.0 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3 Topsoil:

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

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

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

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

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

.7 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.2.

.2 Table:

Sieve Size (mm)	% Passing
2.00	100
0.10	45 - 100
0.02	10 - 80
0.005	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

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

1.4 ACTION AND INFORMATIONAL 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 methods as described in PART 3 of this Section.

.3 Submit to Departmental Representative written notice at least 7 days prior to excavation work.

.4 Submit to Departmental Representative written notice when bottom of excavation is reached.

.5 Submit to Departmental Representative testing results 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 and location plan of relocated and abandoned services, as required.

1.5 QUALITY ASSURANCE

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

.2 Submit design and supporting data at least 2 weeks prior to beginning Work.

.3 Design and supporting data submitted to bear stamp and signature of qualified professional Engineer licensed in the Province of Nova Scotia.

.4 Keep design and supporting data on site.

.5 Engage services of qualified professional Engineer who is licensed in the Province of Nova Scotia in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning if required for Work.

1.6 EXISTING CONDITIONS

.1 Examine soil report bound to this specification.

.2 Buried services:

.1 Before commencing work verify or establish location of buried services on and adjacent to site by careful test excavations. Location of services shown on utilities plan is approximate only and not deemed accurate.

.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 Departmental Representative and establish location and state of use of buried utilities and structures.

.6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by the Departmental Representative.

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

.9 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with Departmental Representative a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.

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

Part 2 Products

2.1 MATERIALS

.1 Granular Backfill: Type 1 or Type 2 granular in accordance with NSTIR specifications, as follows:

Sieve Size (mm)	Percent Passing	
	Type 1	Type 2
80	-	100
56	-	70 - 100
28	-	50-80
20	100	-
14	50 - 85	35-65
5	20 - 50	20-50
1.25	-	-
0.16	5 - 12	3 - 10
0.80	3-8	0 -7

.2 Select (common) Fill: Common material from site which is free of stumps, trees, roots, organics, boulders and masonry larger than 100 mm in any dimension and other deleterious materials as approved by the Departmental Representative.

.3 Imported Fill: Common material from other (Contractor's own) sources which is free of stumps, trees, roots, organics, boulders and masonry larger than 100 mm in any dimension and other deleterious materials as approved by the Departmental Representative.

.4 Utility/Pipe Bedding and Surround: Class "B" Bedding, consisting of 100 mm layer of Type 2 granular in accordance with NSTIR specifications.

.5 C4 Clear Stone (25mm – 75mm): Crushed and screened, hard, durable stone, free from clay and organic matter, and graded as follows:

Sieve Size (mm)	Percent Passing
112	100
80	90 – 100
28	0 – 10

.6 C5 Clear Stone (5mm – 20 mm): Crushed and screened, hard, durable stone, free from clay and organic matter, and graded as follows:

Sieve Size (mm)	Percent Passing
28	100
19	90 – 100
9.5	0 – 40
4.75	0 – 10

.7 Disposal Field (Common) Fill:

.1 Select (common) fill as identified herein and tested to show a required hydraulic conductivity between 20 and 80 x 10-6 m/sec.

.8 Sand: hard, granular, sharp material, well-graded from coarse to fine, free of impurities, chemicals or organic matter, graded as follows:

Sieve Size (mm)	Percent Passing
5	100
0.16	0 – 5

.9 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 0.4 MPa at 28 days.

.2 Maximum cement content of 25 kg/m^3.

.3 Minimum strength of 0.07 MPa at 24 h.

.4 Concrete aggregates: to CSA-A23.1/A23.2.

.5 Cement: Type GU.

.6 Slump: 160 to 200 mm.

.10 Marking Tape: Color coded heavy gauge polyethylene, 150 mm wide indicating the service type buried below.

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

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.

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

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

3.2 SITE PREPARATION

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

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

.3 The Contractor shall not penetrate the asphalt on the Cabot Trail highway.

3.3 PREPARATION/PROTECTION

.1 Keep excavations clean, free of standing water, and loose soil.

.2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.

.3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.4 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL AND STOCKPILING

.1 Do topsoil stripping and stockpiling in accordance with Section 31 14 13 – Soil Stripping and Stockpiling.

3.5 SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with the Provincial Health and Safety Act.

.2 Obtain permit from authority having jurisdiction for temporary diversion of water course if required.

.3 Construct temporary Works to depths, heights and locations as approved by Departmental Representative.

.4 During backfill operation:

.1 Unless otherwise indicated or directed Departmental Representative, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove shoring and bracing.

.2 Remove excess materials from site.

3.6 DEWATERING AND HEAVE PREVENTION

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

.2 Provide for Departmental Representative approval the details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

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

.5 Dispose of water in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

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

3.7 EXCAVATION

.1 Advise Departmental Representative at least 7 days in advance of excavation operations.

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

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 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.

.5 For trench excavation, do not excavate more than 30 m of trench in advance of installation operations. All excavations shall be filled at end of work day prior to leaving site.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material in approved location.

.9 Do not obstruct flow of surface drainage or natural watercourses.

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

.11 Notify Departmental Representative when bottom of excavation is reached.

.12 Obtain Departmental Representative approval of completed excavation.

.13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.14 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with Type 2 granular fill compacted to not less than 100% of SPMDD.

.2 Fill under other areas with Type 2 granular or common fill compacted to not less than 95 % of SPMDD.

.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.

.16 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.8 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below.

.1 Exterior side of structure walls: use Type 2 granular fill to subgrade level. Compact to 95% of SPMDD.

.2 Under concrete slabs: use Type 2 granular fill to underside of base course for concrete slabs. Compact to 98 % of SPMDD.

.3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 granular fill to underside of slab. Compact base course to 98 % SPMDD.

.4 Place unshrinkable fill in areas as indicated.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Hand place material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 Departmental Representative has inspected and approved installations.

.2 Departmental Representative has inspected and approved of construction below finish grade.

.3 Inspection, testing, approval, and recording location of underground utilities.

.4 Removal of concrete formwork.

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

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

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

.4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 300 mm.

.6 Place unshrinkable fill in areas as indicated.

.7 Consolidate and level unshrinkable fill with internal vibrators.

3.11 TESTING

.1 Quality control testing of bedding, surround and backfill shall be carried out and paid for by the Contractor. Submit satisfactory compaction testing results to Departmental Representative for review and approval as results become available.

.2 Departmental Representative may conduct quality assurance testing at own cost to verify testing results of contractor.

3.12 RESTORATION

.1 Replace topsoil as indicated.

.2 Reinstate lawns to elevation which existed before excavation.

.3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

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

.5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A48/A48M-03(2012), Standard Specification for Gray Iron Castings.

.2 ASTM A123/A123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

.2 CSA Group

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data and Shop Drawings:

.1 Submit manufacturer's instructions, printed product literature and data sheets for maintenance holes and catch basin structures and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect maintenance holes and catch basin structures from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Precast maintenance hole units: to ASTM C478M, circular.

.2 Precast catch basin sections: to ASTM C478M.

.3 Joints: made watertight using rubber rings.

.4 Adjusting rings: to ASTM C478M.

.5 Frames and covers:

.1 All manhole covers shall be IMP Type R60 or equivalent.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain approval of Departmental Representative before installing outfall structures, maintenance holes or catch basins.

3.3 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.

.1 Maximum of 3 units behind point of pipe laying will be allowed.

.3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.

.4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% SPMDD to ASTM D698.

.5 Precast units:

.1 Make each successive joint watertight with approved rubber ring gaskets.

.2 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.6 For sewers:

.1 Place stub outlets and bulkheads at elevations and in positions indicated.

.2 Bench to provide smooth U-shaped channel.

.1 Channels with depth equal to diameter of pipes or as indicated.

.2 Benching to drain towards channel, 4% maximum slope.

.3 Curve channels smoothly.

.4 Slope invert to establish sewer grade.

.7 Compact granular backfill to 98% SPMDD to ASTM D698.

.8 Installing units in existing systems:

.1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.

.2 Make joints watertight between new unit and existing pipe.

.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.9 Place frame and cover on top section to elevation as indicated.

.1 If adjustment required use concrete ring.

.10 Clean units of debris and foreign materials.

.1 Remove fins and sharp projections.

.2 Prevent debris from entering system.

3.4 FIELD QUALITY CONTROL

.1 Vacuum Test:

.1 Plug all inlet and outlet pipes. Restrain plugs.

.2 Place and seal vacuum tester head on the manhole frame.

.3 Draw vacuum of 250mm Hg on the manhole and measure the time for the vacuum to drop to 225mm Hg.

.4 Time to be not less than 45, 50, 65, and 80 seconds for manhole diameters of 1050mm, 1200mm, 1500mm, and 1800mm respectively.

.5 For manholes deeper than 6 meters, increase test times by 2 seconds per 300mm of additional manhole depth.

.6 Locate and repair defects if test fails. Retest using same methodology.

.7 Repair leaks regardless of test results.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave work area clean at end of each day.

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

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA B301-10, Standard for Liquid Chlorine.

.2 ANSI/AWWA C651-05, Standard for Disinfecting Water Mains.

.2 ASTM International (ASTM)

.1 ASTM B88-16, Standard Specification for Seamless Copper Water Tube.

.2 ASTM F714-10, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

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 pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certification: to be marked on pipe.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PIPE, JOINTS AND FITTINGS

.1 Polyethylene pressure pipe:

.1 NPS 1/2 to NPS 6: to CAN/CSA-B137.1, PE 4801, DR 17

.2 Polyethylene to polyethylene joints: to be fit using compression joints.

.3 Polyethylene fittings: to CAN/CSA-B137.1, for pipe sizes NPS 4 and less

2.2 WARNING MESH WITH TRACER WIRE

.1 General: Warning mesh to be installed above plastic piping complete with tracer wire for above-ground detection of pipe locations,

.1 Blue mesh to be used for water piping.

.2 Mesh to be buried above pipe a minimum of 300 metres below grade.

2.3 VALVES AND VALVE BOXES

.1 Valves to open counter clockwise.

.2 Ball valve (below ground) to be plastic (PP or similar) with compression joints suitable for connection with HDPE piping and adjustable service box with stem to suit depth of bury.

.3 Ball valves (above ground) to be plastic (PP or similar) with compression joints suitable for connection with HDPE piping.

2.4 VALVE CHAMBER

.1 Precast concrete sections to ASTM C478M.

.2 Valve chamber frames and covers: grey iron castings, minimum tensile strength 200 MPa, with two coats, shop applied, approved asphalt coating.

.1 Design and dimensions as indicated.

.2 Cover to be marked "WATER"/"EAU".

2.5 SERVICE CONNECTIONS

.1 Pipe:

.1 Copper tubing: to ASTM B 88, type K annealed, minimum pressure rating of 1,035 kPa.

.2 Joints: compression type, minimum pressure rating of 1035 kPa.

.3 Plastic curb stops (no drain): to ASTM B584, NSF 61-G, compression type joints. Minimum pressure rating of 1,035 kPa.

.1 Curb stops to have adjustable service box with stem to suit depth of bury.

.2 Top of cast iron box marked "WATER"/"EAU".

.4 Service saddle (if required): bronze body, confined O-ring seal cemented in place, double stainless steel strap type and straps suitable for connecting to a main. Outlet tapped and threaded to ANSI/AWWA C800.

2.6 GRANULAR BEDDING AND BACKFILL

.1 As indicated on drawings and to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Clean pipes, fittings, valves, and appurtenances of accumulated debris and water before installation.

.1 Inspect materials for defects to approval of Departmental Representative.

.2 Remove defective materials from site as directed by Departmental Representative.

3.3 SERVICE CONNECTIONS

.1 Terminate building water service 2 m outside building wall.

.1 Install coupling necessary for connection to building plumbing.

.2 If plumbing is already installed, make connection, otherwise cap or seal end of pipe and place temporary marker in the form of a blue stake to locate pipe end.

.2 Construct service connections at right angles to water main unless otherwise directed. Locate curb stops as indicated.

.3 Employ only competent workers equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.

.4 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.

.5 Install curb stop with corporation box on services NPS 2 or less in diameter.

.1 Equip larger services with gate valve and cast iron box.

.2 Set box plumb over stop and adjust top flush with final grade elevation.

.3 Leave curb stop valves fully closed.

.6 Place temporary location marker at ends of plugged or capped unconnected water lines.

.1 Each marker to consist of 38 x 89 mm blue stake extending from pipe end at pipe level to 600 mm above grade.

3.4 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Ensure trench depth allows coverage over pipe of 1.2 m minimum from finished grade unless indicated otherwise

.3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

3.5 GRANULAR BEDDING

.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to 98% SPMDD to ASTM D698.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling with compacted bedding material.

3.6 PIPE INSTALLATION

.1 Lay pipes to manufacturer's standard instructions and specifications.

.2 Join pipes in accordance with manufacturer's recommendations.

.3 Handle pipe by methods recommended by pipe manufacturer and approved by Departmental Representative.

.4 Lay pipes on prepared bed, true to line and grade.

.5 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.6 Position and join pipes with equipment and methods approved by Departmental Representative.

.7 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.8 Align pipes before jointing.

.9 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.10 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes.

.11 Do not lay pipe on frozen bedding.

.12 Backfill remainder of trench.

3.7 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations as indicated.

.2 Support valves located in valve boxes or valve chambers by means of bedding same as adjacent pipe. Valves not to be supported by pipe.

.3 Install underground post-type indicator valves as indicated.

3.8 VALVE CHAMBERS

.1 Use precast units as approved by the Departmental Representative.

.2 Construct units as indicated, plumb and centred over valve nut, true to alignment and grade, and not resting on pipe.

.3 Set bottom section of precast unit in bed of drainage stone, compacted to 90% SPMDD.

.1 Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar, or combination thereof.

.4 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.

.5 Plug lifting holes with mastic compound or mortar.

.6 Place frame and cover on top section to elevation indicated. If adjustment is required use concrete ring.

3.9 HYDROSTATIC TESTING

.1 Do tests in accordance with ANSI/AWWA C600.

.2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.3 Notify Departmental Representative at least 24 hours in advance of proposed tests.

.1 Perform tests in presence of Departmental Representative.

.4 Test in sections not exceeding 365 m in length.

.5 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated.

.6 Leave valves, joints and fittings exposed.

.7 Open valves.

.8 Expel air from main by slowly filling main with potable water.

.1 Install corporation stops at high points in main where no air-vacuum release valves are installed.

.2 Remove stops after satisfactory completion of test and seal holes with plugs.

.9 Thoroughly examine exposed parts and correct for leakage as necessary.

.10 Apply leakage test pressure of 1035 kPa minimum after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 hours.

.11 No leakage is permitted by the test.

.12 Locate and repair defects if leakage is observed.

.13 Repeat test until defects have been corrected.

3.10 PIPE SURROUND

.1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated on drawings.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 98 % SPMDD to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 98 % SPMDD to ASTM D698.

3.11 BACKFILL

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated on drawings.

.2 Do not place backfill in frozen condition.

.3 Under roadways and walkways, compact backfill to at least 98 % SPMDD.

.1 In other areas, compact to at least 95 % SPMDD to ASTM D698.

3.12 FLUSHING AND DISINFECTING

.1 Flushing and disinfecting operations: to be carried out by the Contractor.

.1 Notify Departmental Representative at least 2 days in advance of proposed date when disinfecting operations will begin.

.2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 0.8 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.

.3 Flushing flows as follows:

Pipe Size NPS	Flow (L/s) Minimum
6 and below	38
8	75
10	115
12	150

.4 Provide connections and pumps for flushing as required.

.5 Open and close valves, hose bibbs and service connections to ensure thorough flushing.

.6 When flushing has been completed, introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.

.7 Disinfect water mains.

.8 Rate of chlorine application to be proportional to rate of water entering pipe.

.9 Chlorine application to be close to point of filling water main and to occur at same time.

.10 Operate valves, hose bibbs and appurtenances while main contains chlorine solution.

.11 Flush line to remove chlorine solution after 24 hours. Chlorinated water shall not be allowed to enter waterways, wetlands or other natural water bodies during flushing.

.12 Measure chlorine residuals at extreme end of pipe-line being tested.

.13 Perform bacteriological tests on water main, after chlorine solution has been flushed out.

.1 Take samples daily for minimum of 2 days.

.2 Should contamination remain or recur during this period, repeat disinfecting procedure.

3.13 SURFACE RESTORATION

.1 After installing and backfilling over water mains, restore surface as indicated.

3.14 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.2 CSA International

.1 CSA B1800-11, Thermoplastic Non-pressure Pipe Compendium.

.1 CSA B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.

.2 CSA B182.11-11, Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

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 pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certification: to be marked on pipe.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PLASTIC PIPE

.1 Type PSM Polyvinyl Chloride (PVC): to CAN/CSA B1800 unless otherwise noted.

.1 Standard Dimensional Ratio (SDR): 28 for pipes 150mm and smaller.

.2 Locked-in gasket and integral bell system.

2.2 GRANULAR BEDDING AND BACKFILL

.1 As indicated and to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewer pipe installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.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.

.2 Clean pipes and fittings of debris and water before installation and remove defective materials from site to approval of Departmental Representative.

.3 Clean and dry pipes and fittings before installation.

.4 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.3 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer or sewer connection.

.3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

3.4 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.1 Do not use blocks when bedding pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 98 % SPMDD.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.5 INSTALLATION

.1 Lay and join pipes to: CSA B1800.

.2 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.3 Handle pipe using methods approved by Departmental Representative.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.4 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Joint deflection permitted within limits recommended by pipe manufacturer.

.7 Water to flow through pipe during construction, only as permitted by Departmental Representative.

.8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.9 Install plastic pipe and fittings in accordance with CSA B1800.

.10 Pipe jointing:

.1 Install gaskets in accordance with manufacturer's written recommendations.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes before joining.

.4 Maintain pipe joints free from mud, silt, gravel and foreign material.

.5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.

.9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 When stoppage of Work occurs, block pipes as directed by Departmental Representative to prevent creep during down time.

.12 Plug lifting holes with pre-fabricated plugs approved by Departmental Representative.

.13 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.14 Make watertight connections to manholes.

.15 Use prefabricated saddles for connecting pipes to existing sewer pipes.

.1 Joints to be structurally sound and watertight.

3.6 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to mid height of pipe to at least 98 % SPMDD to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 98 % SPMDD.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.7 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.

.3 Under roadways and walkways, compact backfill to at least 98 % SPMDD to ASTM D698.

.1 In other areas, compact to at least 95% SPMDD to ASTM D698.

.4 Place unshrinkable fill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.8 FIELD TESTING

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Remove foreign material from sewers and related appurtenances by flushing with water.

.3 Television and photographic inspections:

.1 Carry out inspection of installed sewers by video camera.

.2 Provide the Departmental Representative with a copy of the inspection video.

3.9 CLEANING

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group

.1 CSA B66-10, Design, Material and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks.

.2 CSA A23.4-16, Precast Concrete - Materials and Construction.

1.2 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 utility septic tanks and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect utility septic tanks from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Design concrete septic tank in accordance with CSA B66.

.2 Tank(s) to have minimum total working capacity of 18,000 litres.

2.2 CONCRETE MIXES AND MATERIALS

.1 Concrete mixes and materials: to CSA B66.

2.3 MANUFACTURE

.1 Manufacture units in accordance to CSA A23.4.

2.4 FINISHES

.1 Finish precast concrete tanks to CSA A23.4, commercial grade.

2.5 ACCESS

.1 Include access holes to surface to facilitate cleaning and inspection as indicated.

2.6 TANK BEDDING AND SURROUND MATERIAL

.1 As indicated and in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

2.7 BACKFILL MATERIAL

.1 As indicated and in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for utility septic tank installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Place bedding and surround material in unfrozen condition.

.2 Do excavation in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

.3 Place tank bedding material in accordance with details as indicated.

.1 Compact to 95% SMPDD to ASTM D698.

.4 Make inlet and outlet joints of septic tank watertight.

.5 Conduct leakage test on septic tank in presence of Departmental Representative before backfilling.

.1 Fill tank to level of effluent pipe, and allow to stand for 24 hours.

.2 Allowable leakage is zero.

.3 If leakage occurs, remove seal materials and reseal as directed by Departmental Representative.

.6 Do backfilling in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

.1 Compact to 90% SMPDD to ASTM D698.

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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group

.1 CSA B66-10, Design, Material and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks.

.2 CSA A23.4-16, Precast Concrete - Materials and Construction.

1.2 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 dosing tank and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect dosing tank from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Design concrete tank in accordance with CSA B66.

.2 Tank shall have an internal dosing mechanism capable of mechanically alternating flow between two gravity septic fields.

.3 Dosing mechanism shall be capable of delivering a minimum dose of 1,300 litres.

.4 Internal dosing components shall be made of materials able to withstand repeated use and submergence in wastewater over the long term.

2.2 CONCRETE MIXES AND MATERIALS

.1 Concrete mixes and materials: to CSA B66.

2.3 MANUFACTURE

.1 Manufacture units in accordance to CSA A23.4.

2.4 FINISHES

.1 Finish precast concrete tanks to CSA A23.4, commercial grade.

2.5 ACCESS

.1 Include access holes to surface to facilitate cleaning and inspection as indicated.

2.6 TANK BEDDING AND SURROUND MATERIAL

.1 As indicated and in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

2.7 BACKFILL MATERIAL

.1 As indicated and in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for dosing tank installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Place bedding and surround material in unfrozen condition.

.2 Do excavation in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

.3 Place tank bedding material in accordance with details as indicated.

- .1 Compact to 95% SMPDD to ASTM D698.

.4 Make inlet and outlet joints of dosing tank watertight.

.5 Conduct leakage and function test on dosing tank and alternating dosing mechanism in presence of Departmental Representative before backfilling.

- .1 Temporarily halt dosing function, fill tank to level of effluent pipe, and allow to stand for 24 hours.
- .2 Allowable leakage is zero.
- .3 If leakage occurs, remove seal materials and reseal as directed by Departmental Representative.
- .4 Re-instate dosing function and fill tank to level of effluent pipe. Observe dosing drawdown and alternating septic field selection during operation.
- .5 If a error in function is observed, improve function to the satisfaction of Departmental Representative.

.6 Do backfilling in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

.1 Compact to 90% SMPDD to ASTM D698.

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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavation, Trenching and Backfilling

.2 Section 33 31 13 – Public Sanitary Utility Sewerage Piping

.3 Section 33 36 00 – Utility Septic Tanks

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA-B1800-11, Thermoplastic Non-Pressure Piping Compendium. (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).

.1 CAN/CSA-B182.2-11 PVC Sewer Pipe and Fittings (PSM Type).

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 drainage field materials and include product characteristics, performance criteria, physical size, finish and limitations

.3 Certificates.

.1 Submit one copy of certification or license of approved installers.

1.4 QUALITY ASSURANCE

.1 Use licensed installers who comply with local authority having jurisdiction.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer’s written instructions.

.2 Delivery and Acceptance Requirements: delivery materials to site in original factory packaging, labelled with manufacturer’s name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer’s recommendations in clean, dry, well-ventilated area.

.2 Store and protect drainage field materials from nicks, scratches and blemishing.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GRANULAR BEDDING AND BACKFILL

.1 As indicated and to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

2.2 PIPE

.1 DR35 solvent weld PVC pipe and fittings to CAN/CSA-B182.2, non-perforated.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for drainage field installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Department Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INFILTRATION TRENCH TYPE DISPOSAL FIELD INSTALLATION

.1 Excavate to lines and depths as indicated and in accordance with Section 31 23 33.01-Excavating, Trenching and Backfilling.

.2 Scarify trench base and walls under dry conditions.

.3 Do not operate construction equipment across disposal field.

.4 Place 75mm minimum filter sand in trench bottom.

.5 Install header and alternating gravity dosing box between septic tank and absorption trenches. Installation to be water-tight construction.

.6 Set dosing box and header level as indicated.

- .1 Provide access with removable cover for inspection of dosing box.

.7 Connect lengths of infiltration pipe as per Manufacturer’s specifications and place infiltration pipe on filter sand material.

.8 Connect each distribution pipe stub individually to header and to infiltration pipe as per Manufacturer’s specifications.

.9 Maintain pipe elevations within 5 mm of inverts indicated.

.10 Do not backfill trenches until pipe grade and alignment have been approved by Departmental Representative.

.11 Backfill trenching with material as indicated.

- .1 Do not compact.

.2 Overfill to allow for settlement.

3.3 FINAL 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA B1800 Series-11, Thermoplastic Non-Pressure Piping Compendium.

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 pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certification: to be marked on pipe.

.4 Test and Evaluation Reports:

.1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 HDPE PIPE

.1 Double walled HDPE: to CAN/CSA B1800 with smooth interior surface.

.2 Fittings: bell and spigot.

2.2 GRANULAR BEDDING AND BACKFILL

.1 Granular bedding and backfill material to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe culvert installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.

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

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

3.3 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Obtain Department Representative's approval of trench line and depth prior to placing bedding material or pipe.

3.4 BEDDING

.1 Dewater excavation, if necessary, to allow placement of culvert bedding in dry condition.

.2 Place 150 mm minimum thickness of approved granular material on bottom of excavation and compact to 98% SPMDD to ASTM D698.

.3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Department Representative, free from sags or high points.

.4 Place bedding in unfrozen condition.

3.5 LAYING PIPE CULVERTS

.1 Begin at downstream end of culvert with flanged end of first pipe section facing upstream.

.2 Ensure barrel of each pipe is in contact with shaped bed throughout its length.

3.6 PIPE JOINTS

.1 Joints may be made with rubber gaskets.

.1 Rubber gasket joints:

.1 Install in accordance with manufacturer's written recommendations.

.2 Ensure that tapered ends are fully entered into flanged ends.

3.7 BACKFILLING

.1 Backfill around and over culverts as indicated.

.2 Place granular backfill material in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.

.3 Compact each layer to 98% SPMDD to ASTM D698 taking special care to obtain required density under haunches.

.4 Protect installed culvert with minimum 600 mm cover of compacted fill before heavy equipment is permitted to cross.

.5 Place backfill in unfrozen condition.

3.8 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.

END OF SECTION

APPENDIX A

Geotechnical Investigation

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

September 13, 2016
File: 161413360

Attention: Ms. Audrey Buchanan, Asset Manager
Parks Canada
Cape Breton Field Unit
259 Chemin Park Service Road
Louisbourg NS B1C 2L2

Dear Ms. Buchanan,

Reference: Geotechnical Report – Proposed Trout Brook Campground
Cape Breton Highlands National Park, Nova Scotia

As requested, Stantec Consulting Ltd. has performed a geotechnical investigation for the proposed Trout Brook Campground in the Cape Breton Highlands National Park. The investigation consisted of the excavation of twelve test pits, laboratory testing of select samples of the overburden that were obtained from the test pits, and the preparation of this geotechnical report.

The test pits were excavated on August 24, 2016 at the locations noted on the attached Test Pit Location Plan (Drawing No. 1). The coordinates of the test pits were recorded using a handheld GPS unit with a known accuracy of approximately 3 metres. Each test pit was backfilled with the spoil material and lightly tamped using the excavator bucket.

Upon completion of the field component of the investigation, the samples of the overburden soils that were obtained from the investigation were brought to the Dartmouth laboratory for index testing, which included grain size analyses, moisture content determinations and a remoulded falling head permeability test.

SITE DESCRIPTION

The site is located at the southwestern edge of the Cape Breton Highlands National Park near Cheticamp, Nova Scotia. The site is accessed from the Cabot Trail and is currently used as a picnic area. The current infrastructure consists of gravel roads and shelters for picnic tables. Trout Brook is located to the south of the proposed campground and the northern portion of the site is currently undeveloped.

Our previous experience in the area and geological mapping indicates that the subsurface conditions consist of glacial till comprising of silty sand with gravel to silty gravel with sand, overlying metamorphic bedrock of the Jumping Brook Suite.

SUBSURFACE CONDITIONS

Detailed descriptions of the subsurface conditions encountered are provided on the appended Test Pit Records. An explanation of the terminology and graphics used in this report are also

appended (see the Symbols and Terms Used on Borehole and Test Pit Records). The conditions encountered during the investigation are summarized in the following paragraphs.

A thin surficial layer of sod/rootmat and topsoil was encountered at all test pit locations. The thickness of this layer ranged between 150 and 300 millimetres.

In test pits TP9, TP10, and TP11, a layer of light brown to dark brown silty sand was encountered beneath the rootmat and topsoil layer. The thickness of this layer ranged from 0.25 to 0.5 metres. The relative compactness of this material was described as compact based on the excavator performance. Frequent rootlets were encountered throughout this layer.

In test pits TP11 and TP12, a layer of reddish brown sandy clay to clay was encountered. The relative consistency of this layer was described as stiff to hard. Both test pits were terminated in this layer. A grain size analysis performed on a sample of this material yielded 0% gravel, 12% sand, and 88% silt and clay sized particles. The moisture content of the sample was determined to be 17%.

Test pits TP1 to TP10 were terminated in glacial till which predominantly consisted of light brown to light grey silty sand with gravel to gravel with silt and sand. Frequent cobbles and boulders were encountered throughout the glacial till layer and the relative compactness was described as compact to dense. Grain size analyses tests completed on samples of this material yielded 30 to 70% gravel, 21 to 55% sand, and 5 to 14% silt and clay sized particles. The average moisture content of the samples was determined to be 5%.

A falling head hydraulic conductivity test was completed on a remoulded composite sample of the silty sand with gravel glacial till material. The hydraulic conductivity of the sample was measured to be 2.3×10^{-6} cm/s.

Bedrock was not encountered in any of the test pits excavated for this investigation.

Water seepage was observed in test pits TP5 and TP6 at depths of 1.8 and 3.0 metres, respectively. Water seepage was not observed in any of the other test pits. Groundwater levels are subject to fluctuations by seasonal weather trends and individual precipitation events, as well as with site use and construction activities.

RECOMMENDATIONS

It is understood the proposed development will consist of a campground. At this time, it is unknown what infrastructure will be required as part of this development, therefore we have provided general commentary on site grading and the preparation of building pads as part of this report. If additional recommendations are required as the design progresses, they can be provided at your request. It should be noted that the scope of this investigation did not include an evaluation and/or analysis of the global stability of the existing slope along the coastline.

Reference: Geotechnical Report – Proposed Trout Brook Campground
Cape Breton Highlands National Park, Nova Scotia

Excavation and Fill Placement

It is recommended that the existing layers of rootmat/topsoil be removed prior to the placement of structural fill in any areas where settlement cannot be tolerated. If buildings are being constructed at the site, the rootmat and topsoil should be removed from within the zone of influence of the proposed building pad, which includes the overall footprint and extends laterally beyond the footing perimeter a distance at least equal to the required excavation depth below the footing (i.e., 1 horizontal to 1 vertical structural splay). If required, the site could then be brought up to design grades using structural fill which could consist of select portions of the existing overburden (upon removal of all organic and other deleterious materials), approved common borrow, or imported granular material. The structural fill should be placed within the zone of influence of the building pad and should be compacted to at least 100% standard Proctor maximum dry density. The materials should be placed in lift thicknesses compatible with the compaction equipment utilized to ensure that the required degree of compaction is achieved throughout.

If the test pits that were excavated for the investigation are within the zone of influence of a building, they should be re-excavated and replaced with structural fill as the material was not compacted when the test pit was backfilled.

Bedrock was not encountered in any of the test pits excavated for this investigation, however based on our experience, the bedrock in this area can be undulating and may be encountered closer to the surface between test pit locations.

Foundation Design Parameters

Provided the site is prepared as prescribed above, it is recommended that a factored geotechnical resistance at ultimate limit states (ULS) of 300 kPa and an unfactored geotechnical resistance at serviceability limit states (SLS) of 200 kPa be used for the design of the foundations bearing on undisturbed glacial till or structural fill. These values are based on a 0.6 metre wide strip footing with a minimum burial depth of 1.2 metres below existing grade. A resistance factor of 0.5 has been applied to the ULS value. The serviceability limit states geotechnical resistances are based on a maximum total settlement of 25 millimetres. Unfactored loads should be used for assessment of the SLS bearing resistances.

A minimum soil cover of 1.2 metres is recommended for all footings in unheated structures to provide adequate frost protection. To limit the potential for frost heaving, floor slabs for unheated structures should be placed on a minimum of 50 mm of insulation overlying at least 300 millimetres of free draining granular material (such as 25 mm clear stone or NSTIR Type 1 gravel).

All bearing surfaces should be inspected by experienced geotechnical personnel prior to placement of concrete.

Reference: Geotechnical Report – Proposed Trout Brook Campground
Cape Breton Highlands National Park, Nova Scotia

Temporary Side Slopes

If trenches are required, the temporary side slopes should be cut no steeper than 1.5H:1V and closely monitored for signs of sloughing.

CLOSURE

Use of this report is subject to the Statement of General Conditions provided. It is the responsibility of Parks Canada, who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd. should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report
- Basis of the report
- Standard of care
- Interpretation of site conditions
- Varying or unexpected site conditions
- Planning, design, or construction

This report was prepared by James Mitchell, P.Eng., PMP, and reviewed by Brian Grace, P.Eng. We trust that the information contained in this report is adequate for your present purposes. If you have any questions regarding the contents of this report or if we can be of any further assistance, please do not hesitate to contact the undersigned at your convenience.

Yours truly,

STANTEC CONSULTING LTD.

James S. Mitchell, P.Eng., PMP
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Attachments: Statement of General Conditions
Symbols of Terms Used on Borehole and Test Pit Records
Test Pit Records TP1-TP12
Grain Size Analysis Plots
Drawing No. 1, Test Pit Location Plan

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STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

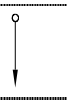
Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

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TEST PIT RECORD

TP01

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP01**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		SOD/TOPSOIL					
		Compact to dense light brown silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders			BS	1	S
1							
		End of Test Pit - no observed groundwater seepage					
2							
3							
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:42

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TEST PIT RECORD

TP02

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP02**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		SOD/TOPSOIL					
		Compact to dense light brown silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders					
1		Dense light grey silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders					
		End of Test Pit - no observed groundwater seepage					
2							
3							
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:42

Stantec

TEST PIT RECORD

TP03

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP03**

DATES: DUG **2016/08/24** WATER LEVEL DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		SOD/TOPSOIL					
		Compact to dense light brown silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders					
1		Dense light grey silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders					
		End of Test Pit - no observed groundwater seepage					
2							
3							
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:43

Stantec

TEST PIT RECORD

TP04

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP04**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		SOD/TOPSOIL					
		Compact to dense light brown silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders - frequent rootlets to 0.46 m depth			BS	1	S
2		Dense light grey silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders					
		End of Test Pit - no observed groundwater seepage					
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:43

Stantec

TEST PIT RECORD

TP05

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP05**

DATES: DUG **2016/08/24** WATER LEVEL **2016/08/24** DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		ROOTMAT/TOPSOIL					
		Compact to dense light brown silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders - frequent rootlets to 0.46 m depth - frequent pockets of coarse gravel		▽			
1							
2							
		End of Test Pit - slight groundwater seepage at 1.83 m depth					
3							
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:44

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TEST PIT RECORD

TP06

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP06**

DATES: DUG **2016/08/24** WATER LEVEL **2016/08/24** DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		ROOTMAT/TOPSOIL					
		Compact to dense light brown silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders - frequent rootlets to 0.46 m depth					
1							
		Dense dark brown silty gravel with sand: TILL - frequent cobbles and boulders		▽			
2							
3							
		End of Test Pit - slight groundwater seepage at 3.05 m depth					
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:44

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TEST PIT RECORD

TP07

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP07**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		ROOTMAT/TOPSOIL					
		Compact to dense light brown silty sand with gravel: TILL - frequent rootlets to 1.2 m depth			BS	1	S
1							
		Dense dark brown gravel with silt and sand: TILL - frequent cobbles and boulders					
2							
3							
		End of Test Pit - no observed groundwater seepage					
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

10 20 30 40 50 60 70 80 90

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

App'd JSM Sep 12 2016 16:8:44

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TEST PIT RECORD

TP08

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP08**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		SOD/TOPSOIL					
		Compact to dense light brown silty sand with gravel: TILL - frequent cobbles and boulders					
3		End of Test Pit - no observed groundwater seepage					

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:45

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TEST PIT RECORD

TP09

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP09**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		ROOTMAT/TOPSOIL					
		Compact light brown silty SAND - frequent rootlets					
1		Compact to dense light grey silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders					
2							
3							
		End of Test Pit - no observed groundwater seepage					
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:45

Stantec

TEST PIT RECORD

TP10

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP10**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		ROOTMAT/TOPSOIL					
		Compact light brown silty SAND - frequent rootlets					
1		Compact to dense light grey silty gravel with sand to gravel with silt and sand: TILL - frequent cobbles and boulders			BS	1	S
2							
3							
		End of Test Pit - no observed groundwater seepage					
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:46

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TEST PIT RECORD

TP11

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP11**

DATES: DUG **2016/08/24** WATER LEVEL DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		ROOTMAT/TOPSOIL					
		Stiff to hard reddish brown sandy CLAY to CLAY			BS	1	S
3		End of Test Pit - no observed groundwater seepage					

UNDRAINED SHEAR STRENGTH - kPa

20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:46

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TEST PIT RECORD

TP12

CLIENT **PARKS CANADA** PROJECT No. **161413360**

LOCATION **TROUT BROOK CAMPGROUND, CAPE BRETON, NOVA SCOTIA** TEST PIT No. **TP12**

DATES: DUG **2016/08/24** WATER LEVEL _____ DATUM **N/A**

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLE TYPE	SAMPLE NUMBER	OTHER TESTS
0		ROOTMAT/TOPSOIL					
		Compact dark brown silty SAND - frequent rootlets					
1		Stiff to hard reddish brown sandy CLAY to CLAY					
2		End of Test Pit - no observed groundwater seepage					
3							
4							
5							

UNDRAINED SHEAR STRENGTH - kPa

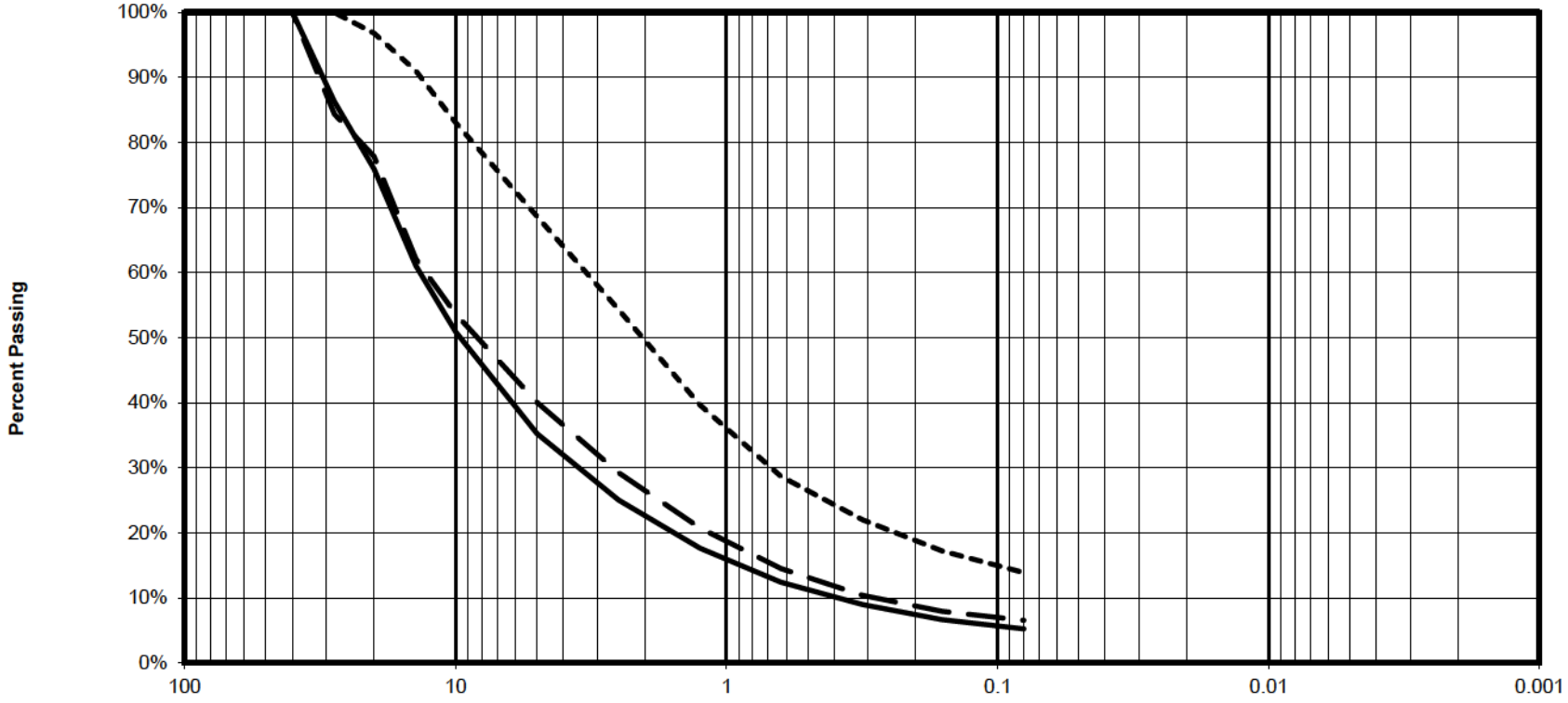
20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

10 20 30 40 50 60 70 80 90

App'd JSM Sep 12 2016 16:8:47

Approved: JSM



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Unified Soil Classification System ASTM D 2487/2488

Curve	BOREHOLE/TESTPIT	SAMPLE	DEPTH (m)	Soil Fractions			Soil Description
				Gravel	Sand	Silt/Clay	
———	TP1	SA1	1.2	65%	30%	5%	Gravel with Silt and Sand: TILL
— — — ·	TP4	SA1	1.8	60%	33%	7%	Gravel with Silt and Sand: TILL
- - - -	TP7	SA1	0.9	31%	55%	14%	Silty Sand with Gravel: TILL

Job No.: 161413360

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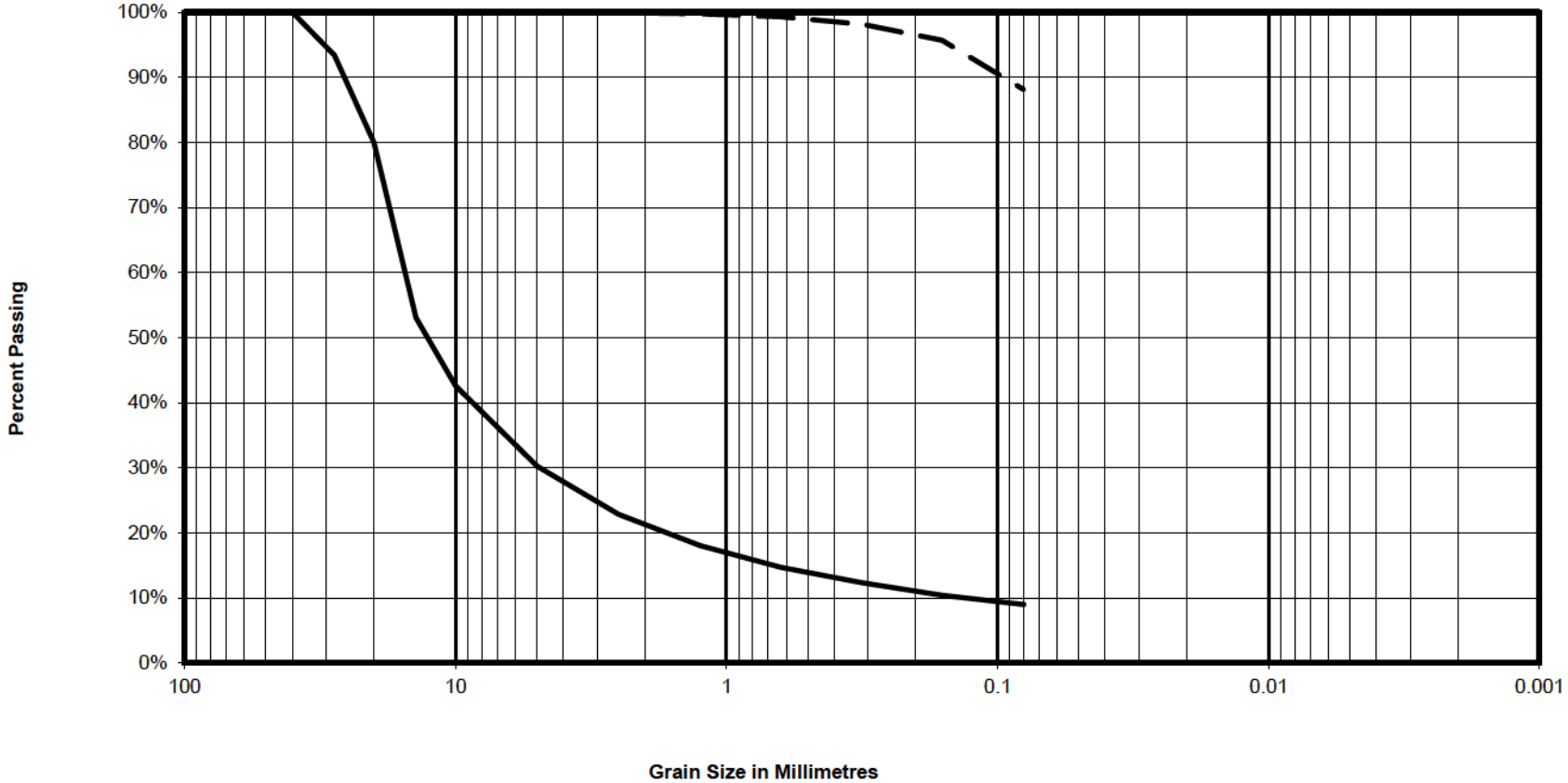
Approved: JSM



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Unified Soil Classification System ASTM D 2487/2488

Curve	BOREHOLE/TESTPIT	SAMPLE	DEPTH (m)	Soil Fractions			Soil Description
				Gravel	Sand	Silt/Clay	
———	TP10	SA1	1.1	70%	21%	9%	Gravel with Silt and Sand: TILL
— — — ·	TP11	SA1	1.2		12%	88%	CLAY

Job No.: 161413360

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KEY PLAN NTS

LEGEND

TEST PIT

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

Reference: GOOGLE EARTH 2016	Job No.: 161413360 Scale: 1:1500 Date: 2016/09/06 Dwn. By: BSP App'd By: JSM	Client: PARKS CANADA AGENCY Site Address: CHETICAMP, NS	Project: NEW TROUT BROOK CAMPGROUND	Drawing Title: TEST PIT LOCATION PLAN	Dwg. No.: 1

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APPENDIX B

BIA

Basic Impact Analysis

TROUT BROOK CAMPGROUND PROPOSAL

(*Trout Brook DUA*)

Cape Breton Highlands National Park of Canada

Cape Breton Field Unit

By: A. Doucette ***Environmental Assessment & Ecosystem Restoration***

File #: CBFU2016-014

October 2016

Parks Canada Parcs Canada

Canada

PROJECT TITLE	***Trout Brook Campground Proposal***
PROJECT LOCATION	Cape Breton Highlands National Park of Canada
PROJECT SITE	Trout Brook DUA - Cabot Trail (west)
PROPONENT	**Audrey Buchanan,** Audrey.Buchanan@pc.gc.ca 902.733.3520
INTERNAL PROJECT #	CBHNPC-2016-014

BACKGROUND

In August 2015 a flood in the Cheticamp River, believed to have been caused by major landslide, had occurred in the upper watershed. The suddenness of the flood resulted in a complete evacuation of the Cheticamp Campground with significant damage to park infrastructure.

In the aftermath, the lower campground was temporarily closed due to the possibility of recurrence and risk to campers. This decision was later supported by a watershed study conducted by Stantec Consulting Ltd. The study essentially indicated that there were potential risks to campers, infrastructure and future operations for this location.

In the end, Parks Canada decided to permanently decommission the lower campground and seek a replacement campground in a more stable environment.

Trout Brook Day Use Area

The Trout Brook DUA was ultimately selected as a campground replacement facility. This, following an extensive review of other potential candidate sites. Deemed ideally suitable for a multipurpose campground, the DUA can accommodate a variety of camping and camping-related activities. The proposal easily blends with the current layout, with relatively fewer impacts to the natural environment compared to selecting a more natural setting.

Selection of the Trout Brook location would help meet demand for prime ocean frontcountry camping. The Corney Brook Campground is a small campground located just north and contains only 20 sites with minimal services. Though small, Corney Brook remains one of the most popular campgrounds with booking at capacity throughout the season. It was therefore felt that a similar picturesque offer would be equally as popular and assist with demand problems at Corney Brook.

Trout Brook would also create opportunity to market this ocean setting to a larger group of visitors, thus becoming a feature attraction for visitors to this region.

PROJECT DESCRIPTION

Although finer design details have yet to be determined, the existing proposal contains sufficient information to warrant BIA completion. Final design will/ may contain service utility (subterranean) maps for power, wastewater, washrooms facilities, Kiosk building, roads, and any other features required to complete this fully functioning campground.

The final design will also incorporate alternative energy options that will permit the highest level of service possible at this location for the most economical short and long term benefits to Parks Canada.

(Note. A *Cultural Resource Impact Analysis* (CRIA) is being conducted in conjunction with this BIA – aims to mitigate potential impacts to cultural resources).

Electricity

Ideally, a modern campground developed for tenting and small campers each site should be supplied basic electricity at their individual site to charge phone, provide small light, etc. to allow for small but convenient electrical needs. In the event additional electrical (up to 20amps) might be possible through an alternative energy source in this volume would be considered.

Installation of electrical should have minimal visual impact so any systems should be underground or very low visual impact on the ground surface, overhead wires will not be an option at this location.

Water and Sewer

Water and sewer will likely not be a possibility at each individual site but group washrooms, shower facilities, food preparation sinks, should be the minimum requirement for this site with a large enough capacity to meet the number of sites being designed. This may require some creative solutions to ensure this is not a large long term maintenance for the Park particularly with the disposal of wastewater. It may require some composting / recycling options for wastewater streams as it is not the intention to get into wastewater disposal fields so close to the ocean. The use of existing DUA facilities would be repurposed to house some of the new campground buildings.

Potable water is the typical standard for Parks Canada facilities and is the objective for this site particularly to have the ability to provide a source of drinking water for the food preparation sinks and if at all possible in the shower facilities. There are some current wells near this site which maybe a possible source of water but they have not been confirmed in anyway by Parks Canada. (It will be the Consultant's responsibility to verify their potential. In the event these options are not a possibility it will be up to the Consultant to find an acceptable water source to supply a continuous source of water to this location).

Accommodation

Over the past number of years, PCA has been installing some new camping options such as: the Otentiks, cocoon, etc. Such outdoor accommodation are for those who want the majority of the facilities to be provided for them when they arrive at the campground. These facilities have been inserted into existing campgrounds with tremendous success to date. PCA will install several of these structures at this location to blend with the current layout.

Given this location was originally inhabited by Acadian settlers who were expropriated it was felt the permanent accommodations could be built using some of their old building techniques and display a bit of the traditions of the Acadians to incorporate a very unique part of history back into this site. Some examples of this would be windows on only 1 side of the building, sloped roofs and small buildings to make them more resistant to the wind conditions that are normally present on this site.

All designs for this site must carefully examine all new site locations to ensure they have maximum protection against the tremendous wind forces that can sometimes effect this site. It is the intention of Parks Canada to keep this campground open during the entire season regardless of wind conditions. So the design must ensure safety of visitors during adverse conditions.

Other Infrastructure

Other features planned for this site to make it appealing to the campground clientele according to PCA research include:

Beach access: the proposal calls for the development of two locations for beach access, being developed in response to the need for beach access by visitors.

Hiking or biking trail access: will be provided to Le vieux chemin du Cap-Rouge which is a trail located just across the road from this new campground. PCA will also develop a new trail connection from the campground to several house foundations that were exposed during the construction of the new highway adjacent to this new campground location. PCA is also reviewing further trails and access point. For example, other campground connecting infrastructure such as the design of roads, access to trails, access to the beach, access to all buildings are currently being considered to impiove to the campers.

Alternate camping locations: there is additional potential on Le vieux chemin du Cap-Rouge trail to provide alternative camping options with cabins or other permanent structures but this can only be accomplished with a walk-in offer.

Fire pits: are very popular at all of the Parks Canada campgrounds especially at the camper's individual sites. In order to achieve this it will be necessary to review the fire potential at this location with the extreme wind conditions that can happen and ensure fire risks are mitigated through careful placement of fire pits if this option is incorporated into the offer.

WIFI: is a modern option that is becoming increasingly popular with visitors and should be incorporated into the design at this location if there is an economical means to accomplish this objective. Associated infrastructure will be used on site to bring this to fruition.

Kiosk building: in response to the significant number of new sites, PCA would like to construct a Kiosk near the current entry access road that would permit processing of visitors that enter this site. The Kiosk will require phone, data, electrical and washroom access to operate so it will be particularly challenging given the limited utility capabilities at this location.

SCOPE

This Basic Impact Analysis applies to the modification of existing Trout Brook DUA and nearby surroundings, an area on which has already experienced significant human development (farms, roads, houses, etc.)

The proposed facilities are an opportunity to engage and enhance visitor experience and include the proposed campground and associated infrastructure (e.g., playground, shelters, washroom and shower facilities, kiosk, interpretive displays, benches, picnic table, venues and outdoor sports field).

General activities include:

- routine maintenance and repair of infrastructure (e.g., shelters, fencing, dirt roads, etc.).
- burial of service lines, electrification of campgrounds (e.g., installation of electrical and water outlets)
- maintenance and repair of utility lines (e.g., water, sewer)
- reconfiguration of DUA to accommodate campsites (e.g., tent-pads for tent-specific sites, pull-through RV sites, gravel fill, cribbing, site delineation, levelling and widening, improved sight-lines, flow and drainage)
- modification, maintenance, repair and/or demolition of buildings and structures (e.g., outdoor shelter, fire wood storage, signs, interpretive and information panels)
- parking lot expansion (e.g., additional parking for walk-in sites)
- modification, maintenance and repair of playgrounds, trails, and roads
- vegetation management for improved sight-lines, natural screens, hazardous trees, wildlife attractants and wildfire management (e.g., clearing and grubbing, trimming, re-vegetation)
- wildlife management (e.g., fencing)
- earthworks (e.g., trenching, excavation, implementation of sediment and erosion control measures)
- material transportation, handling and storage
- waste management (e.g., material collection and disposal, recycling)
- equipment operations (e.g., hand machinery, vehicles such as ATVs, excavators)

ENVIRONMENTAL EFFECTS (*Components likely affected***)**

Soil/Land Resources:

- Soil compaction and rutting
- Soil erosion, loss of topsoil and exposure of subsoils
- Soil contamination from waste (e.g., garbage, litter, sewage, fuel)
- Increase in anthropogenic footprint

Air/Noise Quality:

- Temporary decreased ambient air quality (e.g., dust, equipment emissions)
- Temporary increased levels of CO2 and other pollutants
- Increased ambient noise levels

Water Quality:

- Surface and groundwater contamination from waste (e.g., garbage, litter, sewage, fuel)
- Sedimentation, causing increased turbidity
- Changes in temperature regime and natural drainage patterns

Vegetation:

- Damage to and removal of vegetation
- Disturbance of adjacent natural areas
- Root exposure, (physiological stress), in the case of trees susceptibility to windfall
- Introduction of invasive alien species, or expansion of existing populations
- Impacts on valued and sensitive vegetation features
- Habitat destruction and mortality from wildfire

Wildlife:

- Disturbance during construction causing displacement/preferred habitat avoidance
- Wildlife habituation/attraction to artificial food sources from garbage or litter
- Damage to nests/dens/roosts and disruption of nesting/denning/roosting animals
- Loss of food sources and habitat
- Introduction of invasive alien species, or expansion of existing populations
- Habitat destruction and mortality from wildfire

Visitor Experience:

- Reduced quality of visitor experience due to noise and presence of construction equipment
- Increased visibility of human disturbance on the landscape and decreased aesthetic
- Reduced accessibility to portions of the site where work is taking place
- Hazard to visitors and staff due to construction activities
  (e.g., heavy equipment and hand tool operation, helicopter use, tree removal)
- Loss of educational opportunities

Cultural Resources:

- Adverse effects on the heritage value or character-defining elements of a cultural resource or a heritage place, including: Impacts to archaeological resources (known or potential) from displacement or destruction resulting in loss of heritage value
- Adverse effects on cultural landscapes or landscape features of heritage value
- Wildfire risk

MITIGATION MEASURES

Work Site

1. All workers must review the mitigation measures and any site specific considerations with designated PCA staff before work begins.
2. Staging and parking areas for material and equipment must be identified, including duration of use, within an existing disturbed footprint (e.g., roadway, gravel surface, previously disturbed area with high resiliency).
3. Material drop sites (staging, storage) must be approved by designated PCA staff.
4. Cover construction material with weighted tarps when appropriate.
5. Use existing roadways, trails, disturbed areas or other areas as approved by PCA staff for site access, travel within the site and construction activities (e.g., sawing wood).
6. Clearly mark work site and restricted areas with stakes, biodegradable flagging tape or other means; remove when project is completed.
7. Keep disturbance footprint as small as possible and limit vehicle access to essential vehicles only.

Equipment Operations

8. Equipment must be properly tuned, clean and free of contaminants, in good operating order, free of leaks (e.g., fuel, oil or grease), and fitted with standard air emission control devices and spark arrestors prior to arrival on site.
9. During construction, any required cleaning of tools and equipment must be done greater than 30 meters from waterbodies to prevent the release of wash water that may contain deleterious substances.
10. Select equipment appropriate to the nature of work being conducted (e.g., avoid using large scale machinery when hand tools or smaller scale machinery could be used).
11. The crossing of any waterbody by construction equipment, or the use of such equipment within waterbodies must be approved by designated Parks Canada staff. If approved:
    - Consult with designated Parks Canada staff prior to project start-up to determine single entry and exit points for any watercourse crossings.
    - Use small scale equipment when at all possible (e.g., mini excavator, ATV, Ditch Witch)
    - Use established/constructed fords when available.
    - Protect access points (e.g., swamp mats, pads).
12. When crossings are not required, operate machinery above the High Water Mark and minimise disturbance to the banks and waterbody.
13. Use low pressure/rubber tracked equipment or access matting where feasible to minimize soil compaction and ground disturbance.
14. Heavy equipment operating on paved surfaces should be equipped with street pads; damage to paved surfaces must be restored to original conditions.
15. Minimize idling of engines, contingent on operating instructions and temperature consideration.

16. Machinery (e.g., excavators, bobcats, chainsaws, generators) must be stored, maintained and refuelled on a flat surface, outside the drip line[1] of trees and a minimum of 30 meters from waterbodies, as measured from the High Water Mark; increase the 30 meter buffer depending on level of risk and site specific conditions. Refueling must take place on a tarp or portable berm, or on compacted ground.
17. Consider using bio-degradable chain oil/vegetable oils in chain saws especially when working within 30 meters of a waterbody.
18. If operating chain saws directly over or adjacent to waterbodies is unavoidable, use measures such as tarps to trap and prevent debris from entering the waterbody as much as possible.
19. Generators must be secured to prevent movement during operation and set up on an impermeable fuel mat with a berm or within a container that can contain 150% of the volume of fuel in the generator.

Construction

20. Ideally, use timber that contributes to sustainable practice, such as recycled old growth or certified materials (e.g., Forest Stewardship Council certification). Trees of significant importance to the landscape must not be used unless otherwise directed by designated PCA staff.
21. When building with unfinished wood, consider using species native to the area as directed by designated PCA staff.
22. Use natural material and environmentally-friendly finishes (e.g., paints and stains) and products whenever possible.
23. When practical, consider pre-fabrication at an approved off-site location to minimize on-site construction impacts.
24. When practical, treatment of wood products (e.g., preservatives, paints, stains) should be done at an approved location prior to transport to the site.
25. Treated wood must be handled, installed, and disposed of according to the Parks Canada Guide for the Use, Handling and Disposal of Pressure Treated Wood 2009 or contact the Parks Canada Environmental Management Team for advice.
26. Minimise the number of saw cuts made to treated wood in the field. If unavoidable, cut treated wood away from waterbodies and over tarps to catch debris; cuttings, sawdust and other treated wood waste material must not enter waterbodies.
27. All cuttings, sawdust and other treated wood waste material must be collected and disposed of at an approved disposal facility.
28. Treated wood must not be burnt or left onsite to decay.

Invasive Alien Species

29. Footwear, clothing, equipment and machinery coming into contact with the terrestrial or aquatic environment must be free of invasive alien species individuals, seeds, propagules (i.e., any other material that may cause the spread of the species) and pathogens. In particular:
    - Equipment from outside the protected heritage place must be washed/steam cleaned prior to arrival.
    - Ensure that footwear, clothing and equipment are free of invasive alien species (e.g., seeds, propagules) when travelling between invaded and uninvaded terrestrial and aquatic sites within the protected heritage place.
30. All soil, gravel, untreated construction lumber, erosion and sediment control products (e.g., hay, straw, mulch), or other applicable materials from outside the protected heritage place must be from a certified weed-free source.
31. Ensure that organic material (e,g., topsoil, borrow and fill material, gravel) taken from the construction site is free of invasive alien species before using in other parts of the protected heritage place.
32. Minimise ground disturbance and vegetation removal, as practical and within project requirements.
33. Minimise bare soil exposure (e.g., cover stockpiled material with tarps, plant native species, cover with natural mulch/ground coverings).
34. Stabilize and re-vegetate disturbed areas as soon as possible with native plants, soil and seed mix approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion and vegetate the following spring.
35. Monitor disturbed and re-vegetated areas for several growing seasons to ensure that native vegetation is growing successfully and invasive alien species spread is prevented.

Waste

36. All wildlife attractants must be secured (e.g., petroleum products, human food, recyclable drink containers and garbage) within wildlife-proof containers, a secure building or vehicle. Keep food waste separate from construction waste and remove daily; if daily removal is not possible, secure until it can be removed.
37. Notify designated PCA staff should wildlife gain access to the above mentioned attractants.
38. All construction materials must be removed from the site on project completion (e.g., refuse material, waste petroleum, unused concrete bases).
39. Contain wastes and transport to an approved waste landfill site outside the Parks Canada protected heritage place, unless otherwise directed; cover waste loads during transportation.
40. If required, portable sanitary facilities must be serviced on a regular basis and accumulated waste disposed at a sanitary waste disposal facility. The facilities must have sufficient capacity and be managed to ensure waste is not discharged to the receiving environment.

Hazardous Material

41. Prevent the release of hazardous substances into the environment, including but not limited to, petroleum products and their derivatives, antifreeze or solvents.
42. All on-site personnel must be briefed on reporting requirements for hazardous materials spills; spills must be reported immediately to designate PCA staff.
43. All construction sites must be equipped with containers suitable for the secure, temporary storage of hazardous wastes, separated by type.
44. A spill contingency response kit including sorbent material and berms to contain 110% of the largest possible spill (i.e., fuel or other toxic liquids) related to the work must be available on site at all times. On-site personnel must be aware of its location and trained in its use. Any contaminants must be recovered at source and disposed according to applicable laws, policies and regulations.
45. Identify and handle all toxic/hazardous materials as required under the *Canadian Environmental Protection Act*, *Transportation of Dangerous Goods Act* and Workplace Hazardous Materials Information Service.
46. Petrochemical products, paints and chemicals must be stored a minimum of 30 meters away from waterbodies and secured overnight in a Parks Canada approved enclosed area under lock and key; increase the 30 meter buffer depending on level of risk and site specific conditions.
47. Any hazardous waste or contaminated material uncovered during excavation / construction, must be investigated, source identified, removed and disposed of outside the protected heritage place at an approved facility. Disposal documentation must be provided to designated Parks Canada staff.

Wildlife

48. On-site personnel must be made aware of and report any incidental sightings of species at risk immediately to designated Parks Canada staff.
49. Schedule operations to avoid critical wildlife life stages (breeding, nesting, denning, roosting, rearing, migration). Consult with designated Parks Canada staff to discuss site-specific wildlife concerns.
50. Follow Reducing Risk to Migratory Birds guidance from Environment and Climate Change Canada, including avoiding vegetation clearing during site-specific migratory bird timing windows. Consult with designated Parks Canada staff for specific approaches to avoiding impacts on migratory birds (e.g., nest surveys, exclusion zones for located nests, area avoidance).
51. Should active nests, dens, roosts or calving areas be discovered, stop work and contact designated Parks Canada staff immediately for direction.
52. Conduct activities during daylight hours, avoiding critical foraging times (dusk and dawn).
53. Construct and erect fences in a manner that minimises impacts on wildlife movement. Consult with designated Parks Canada staff to determine appropriate fence design and location.
54. Minimize the time excavations remain open and cover or fence when left unattended to reduce the potential for wildlife injury.
55. Never approach or harass wildlife (e.g., feeding, baiting, luring).

56. If wildlife is observed at or near the work site, allow the animal(s) the opportunity to leave the work area and away from areas of potential conflict.
57. Designated Parks Canada staff must be alerted immediately to any potential wildlife conflict (e.g., aggressive behaviour, persistent intrusion), distress or mortality. In the case of aggressive behaviour or persistent intrusion, stop work and evacuate the area.
58. On site workers must receive any required wildlife awareness training, according to field unit policy.

Vegetation

59. Vegetation management around infrastructure should follow FireSmart guidelines where applicable; consult with the local Parks Canada Fire Management Officer/Fire Operations Coordinator for site specific considerations. As a general rule:
    - Maintain mowed grass 10 meters around infrastructure.
    - Vegetation selection around infrastructure should favor deciduous trees instead of coniferous trees.
    - Dispose of vegetation slash and dead woody debris away from infrastructure and out of visitor sight.
    - Coniferous trees in a 30 meter radius around infrastructure should be limbed/pruned to 3 meters in height.
60. Burning is not permitted within the protected heritage place unless approved by Parks Canada.
61. Where re-vegetation is required, use weed-free topsoil, native plants and seed mix approved by designated Parks Canada staff.
62. Stay within existing disturbed areas as much as possible when conducting maintenance activities.
63. Consult designated Parks Canada staff to determine appropriate methods for handling dangerous or fallen trees blocking or encroaching on campsites and day use areas and on the proper disposal methods.
64. Natural features (e.g., trees, shrubs, rocks) should be left undisturbed as close to the campsite or day use area as possible unless otherwise directed by designated Parks Canada staff.
65. Employ pruning techniques to minimise risk of tearing the bark and harming the tree; ensure that only branch tissue is removed and stem or trunk tissue is left undamaged.
66. Carry cut branches 30 meters away from infrastructure to avoid becoming a fire hazard. Spread branches out with cut ends facing away from view.

Clearing and Grubbing

67. Protect trees and plant species of high ecological, heritage or cultural value; all clearing activities must be flagged and pre-approved by designated Parks Canada staff.
68. Retain a 30 meter vegetated buffer, from the High Water Mark of waterbodies and a 15 meter buffer from steep slopes. If clearing is required within the buffer zone, conduct minimal selective clearing by hand to ensure soil stability and prevent run off. In sloped areas, buffers should increase in width as the slope increases.
69. Clear minimum area necessary; trees should be removed only as necessary for project completion, visitor safety or wildfire risk reduction.

70. When felling trees, precautions must be taken to minimise damage to surrounding vegetation.
71. The felling of trees with obvious wildlife use (e.g., snags with cavity nests, trees with stick nests) must be avoided wherever possible; if unavoidable, designated Parks Canada staff approval is required.
72. Cut stumps as close to the ground as possible. If clearing is conducted during winter in snow cover, return to site after snow melt to flush cut stumps as required.
73. All cut wood is the property of Parks Canada; consult with designated Parks Canada staff to determine appropriate cutting methods, use and disposal of cut wood and other plant material.
74. If woody debris is chipped, spread thinly within the surrounding forest with space between the chips to ensure native vegetation can grow and re-establish; spreading too thick may result in growth suppression and fire hazard.
75. Where practical, clear trees in a phased approach provided timing windows for critical wildlife life stages can be respected. Ideally, trees should not be cut until construction reaches them, in case last-minute adjustments are necessary.
76. Salvage and replant small trees when appropriate or dispose as directed by designated Parks Canada staff.
77. When possible, conduct work when the ground is frozen or under a condition (such as snowfall) that limits ground compaction. If not possible, consider the use of rig mats or other appropriate measures to minimise impacts.
78. Protect roots of trees to drip line to prevent disturbance or damage. Avoid traffic, dumping or storage of materials over root zone.
79. When log ends or stumps are freshly cut and exposed within sight lines, rub exposed area with soil to reduce the brightness of fresh saw cuts.

Riparian

80. Removal of riparian vegetation should be kept to a minimum and undertaken only when absolutely required. When practical, prune or top vegetation instead of grubbing/uprooting.
81. Combined maintenance activities (e.g., mowing, brushing, topping, slashing) will affect no more than one third of the total woody vegetation, such as trees and shrubs, within 30 meters of the High Water Mark in any given year.
82. Use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction.
83. Ensure canopy vegetation immediately adjacent to waterbodies is maintained unless deemed a hazard.
84. When practical, alter riparian vegetation by hand. If machinery must be used, operate on land and minimize disturbance to the banks of the waterbody.
85. Restore banks to original condition should any damage occur.
86. When altering a tree on the bank of a waterbody, ensure the root structure and stability are maintained.
87. Organic material and debris must not be allowed to enter waterbodies.
88. Minimize removal of natural woody debris, rocks, sand or other materials from the banks of waterbodies and avoid any disturbance below the High Water Mark.

Erosion and Sediment Control

89. Apply Invasive Alien Species mitigations as appropriate.
90. Schedule operations to avoid wet, windy and rainy periods or very dry periods that may increase erosion and sedimentation.
91. Wet down dry, exposed soils, to reduce dust.
92. In areas prone to erosion, install erosion and sediment control measures before starting work, especially within 30 meters of a waterbody.
93. Regularly inspect and maintain erosion and sediment control structures during all phases of the project and modify measures as necessary.
94. Select erosion and sediment control products that correspond with the nature and duration of the project.
95. Use erosion and sediment control products made of 100% biodegradable materials (e.g., jute, sisal or coir fiber) when possible. Ensure backing materials are also biodegradable.
96. Use of hay or straw in erosion and sediment control are potential wildlife attractants and may contain invasive species; use must be approved by designated Parks Canada staff.
97. Use sediment and erosion control products that reduce potential for wildlife entanglement[2] when possible. These options include:
    - Net-less erosion control blankets made of excelsior or loose mulch and unreinforced silt fences.
    - Netting with a loose-weave wildlife safe design.
98. Limit duration of soil exposure; phase activities whenever possible and restore disturbed areas as soon as possible.
99. Avoid equipment operation on steep or unstable slopes and in areas prone to erosion such as sand dunes.
100. Manage water flowing onto the site as appropriate for the project:
    - Divert upland surface runoff away from exposed areas.
    - Filter water being pumped/diverted from the site; silt-laden water must not be pumped directly into a waterbody (e.g., pump/divert water to a vegetated area 30 meters from the waterbody, a constructed settling basin or other filtration system).
    - Minimise slope length and gradient of disturbed areas.
    - Cover erodible soils with mulch, vegetation, or rip-rap.
    - Construct check dams or similar devices in constructed swales and ditches.
101. Consider removing and maintaining sod mats for improved re-vegetation success and erosion control; disturbed areas should be reclaimed with topsoil.

102. Cover spoil piles with biodegradable mats or tarps or plant them with native grass or shrubs approved by Parks Canada.
103. Topsoil separation is required; stockpile topsoil away from subsoils and spoil material and more than 15 meters away from waterbodies, drainage features and/or the top of steep slopes.
104. Store excavated soils on tarps to limit damage to underlying vegetation and cover with weighted tarps if left for an extended period of time.
105. Excess organic material will be distributed within the construction area or other existing un-vegetated areas.
106. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.
107. Remove temporary erosion and sediment control products, especially non-biodegradable materials, when they are no longer required.

Visitor Safety and Experience

108. If possible, schedule construction activities outside peak visitor season.
109. The work site will be closed and marked while active construction, repair or maintenance is underway; consider temporary detours or reroutes as appropriate.
110. If closing the area is not possible, maintain a safe working distance between work activities and visitors; consider the use of lookouts to manage traffic through the construction/hazard area.
111. As much as possible, schedule noisy activities to minimise impacts to visitors, especially around high visitor use areas.
112. Secure and clearly mark unattended safety hazards (e.g., excavations, unsecured decking on a bridge, debris piles) with fencing, warning signs, area closures or combination thereof.

Cultural Resources

113. Apply any mitigation measures that may have been previously identified by a Parks Canada archaeologist, the Federal Heritage Buildings Review Office, and/or other conservation specialist (e.g., cultural landscapes or landscape features of heritage value) for the immediate area of work).
114. Avoid known and potential archaeological sites.
115. Stockpiled material must not be permitted to damage or bury known cultural resources.
116. If cultural resources are encountered, work must cease in the immediate area and designated Parks Canada staff notified (Contact Maura McKeough at Maura.McKeough@pc.gc.ca or 902.733.3530).
117. Notify the site supervisor upon discovery of any archaeological resources. If features (i.e., structural remains and/or artifact concentrations) are encountered, leave in place, mark the location (e.g. with prominent flagging) and contact designated Parks Canada staff to take photographs and, if possible, depth measurements. The designated Parks Canada representative must provide the information immediately to the Terrestrial Archaeology section for an assessment of significance before work can resume.

Application of Paint, Sealant or End Cut Treatments

118. When practical, treatment of wood products (e.g., preservatives, paints, stains) should be done at an approved location prior to transport to the site. Field treatments should be applied over tarps or in another approved contained area and not be applied over or within 30 meters of water. Treatments must be approved by designated Parks Canada staff.
119. Use plastic drip tarps to capture and contain paint drips, spills and spray.
120. Transfer of paint or other sealants from storage and mixing containers into application containers or devices must be conducted over tarps; consider using secondary containment vessels with a minimum holding capacity of 110% of the paint containing vessel to minimize the risk of spillage.
121. Cleaning of painting equipment will be conducted in a location approved by Parks Canada; washwater must not be permitted to enter any waterbody.
122. All waste paint and paint-solvent solutions must be disposed of in accordance with applicable federal, provincial, and municipal legislation; no disposal of waste paint or paint-solvent mixtures is permitted at the project site.
123. If paint will be applied by spray, equipment must be adjusted to minimize spray drift.
124. On-site personnel will only carry minimum quantities of paints and solvents required in the work area.

Trenching and Excavation

125. Apply Erosion and Sediment Control mitigations as required.
126. Excavations must be drained (but not directly into a waterbody), back-filled and compacted as soon as possible.
127. Under thawed conditions, backfill material will be compacted prior to topsoil replacement; distribute topsoil evenly over the excavated area as per Parks Canada specifications.
128. Under frozen ground conditions, material will be sufficiently spread over the excavated site to allow for settlement under thawed conditions. Where practical, topsoil replacement will be postponed until the backfill has thawed, settled and dried out.
129. Re-vegetation must be undertaken in consultation with designated Parks Canada staff after excavations have settled and are level with surrounding landscape.
130. Dispose of overburden as directed by designated Parks Canada staff.

Demolition

131. Prior to commencement of demolition activities, all structures must be surveyed by experienced personnel from within or approved by Parks Canada for the presence of wildlife (e.g., roosting bats, nests, dens). Work should not take place during critical wildlife stages. Should wildlife be discovered, work will cease in the immediate area and designated Parks Canada staff contacted for further direction.
132. Prior to commencement of demolition activities, water and septic systems, lines and/or fields must be identified and precautions taken during the operation of heavy equipment to avoid damaging them.

133. Residual septic systems, water lines and wells of no further use must be removed, capped or decommissioned according to the appropriate federal or provincial legislation.
134. All salvageable, non-combustible and non-hazardous materials will be removed, reused and recycled to the greatest extent possible. Remaining material considered to be waste and demolition debris is to be disposed of at an approved disposal facility.
135. Any hazardous material (asphalt shingles, creosote treated wood, asbestos, lead paint, moulds, animal excrement, paints, automotive products, electrical equipment) and pollutants such as fuels and solvents found on-site will be separated and removed to an approved disposal facility.
136. Burning or burying of hazardous materials or any materials (e.g., plastics) which may be harmful to the environment is prohibited.
137. If undocumented contamination is found, cease work immediately and contact designated Parks Canada staff.
138. Ensure that well closures are completed as quickly as possible according to the appropriate federal or provincial legislation and are securely covered if left unattended.
139. Consult with designated Parks Canada staff to determine whether full excavation and removal of all subsurface infrastructure (e.g., pipes, cement structures, wires) is required. Backfill any excavation with clean, weed-free topsoil.
140. Ensure wastes from demolition activities do not enter waterbodies (e.g., use tarps to capture debris). Any waste that does fall into a waterbody will be immediately retrieved, provided worker safety is not compromised, and if removal can be done without excessive disturbance of bottom sediment.
141. Cover and contain fine particulate matter during transport to and from the site.

Rehabilitation

142. Use stockpiled topsoil from the site to facilitate rehabilitation activities.
143. Shape loosened soils to match the local terrain.
144. Ensure noticeable construction impacts (e.g., ruts, holes, depressions, compacted areas) are appropriately re-graded, back-filled with topsoil, re-contoured and capped in preparation for restoration.
145. Transplant shrubs and small trees displaced during clearing and construction activities, in accordance with FireSmart guidelines and in consultation with the local Parks Canada Fire Management officer or Fire Operations Coordinator.
146. All exposed soil, following completion of construction activities, will be stabilized and/or re-seeded as soon as possible using native plants, soils, seed mix and seed application approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion and vegetate the following spring.
147. Reclaim eroded areas and ensure long term erosion control measures are identified and installed as required.

Accidents and Malfunctions

148. The likelihood of accidents or malfunctions occurring and causing negative environmental impacts due to project activities is minimal. Potential accidents and malfunctions may occur at the staging location and during the construction and operation phases. These may include: vehicle collisions; spills from equipment operated on site; structural failures; spills or leaks (from paint, chemicals, and concrete) into the terrestrial or aquatic environment. Project activities that could result in accidents and malfunctions largely relate to the operation and maintenance of heavy machinery, vehicles, and hand machinery. Structural failures, vehicle collisions, spills, and leaks would likely be attributed to human error. Spills resulting from improperly stored materials are also possible.

Accidents and malfunctions will be avoided through compliance with mitigation measures.

In addition to the above-noted mitigation, the Proponent should adhere to mitigation contained within Parks Canada's *National Best Management Practices for Roadway, Highway and Parkway and Related Infrastructure* where appropriate (Available upon request).

EFFECTS ANALYSIS

The most important **positive** effect is the expected improvements to Visitor Experience and the new offer. The most important **negative** effect would be increased footprint to a relatively undisturbed area for the Trout Brook DUA. This impact however will be offset by the decommissioning and remediation of the former Lower Cheticamp River Campground.

CONSIDERATION OF THE NEED FOR PUBLIC PARTICIPATION & ABORIGINAL CONSULTATION

The public is expected to be in favor of the proposed undertaking due to interest associated with this new offer.

Aboriginal Consultation is the responsibility of the functional manager with discussions ongoing.

EFFECT SIGNIFICANCE

Taking into account the specific mitigation measures mentioned above, the project is not likely to cause significant residual environmental effects. Implementation of the chosen alternative would have a limited effect on natural resources and therefore no cumulative environmental impacts are forecasted.

SITE INSPECTION

Periodic surveillance monitoring is required by qualified PCA personnel and may include daily site visits during work activity, attending related meetings and briefings, evaluating effectiveness of mitigation measures, and consultation with staff and work crews during work activity.

DECISION

Taking into account implementation of mitigation measures outlined, the project is:

✓ **Unlikely** to cause significant adverse environmental effects

_____ **Likely** to cause significant adverse environmental effects.

SIGNATURES AND APPROVAL

BIA Author

Name: Archie Doucette *Environmental Assessment Coordinator, CBFU*

Signature: Archie Doucette 29 Sept. 2016

BIA Recommender

Name: Maura McKeough, *A/ Cultural Resource Manager, CBFU*

Signature: Maura C McKeough Date: 29 Sept 2016

BIA Recommender

Name: Heather Davis, *A/ Resource Conservation Manager, CBHNPC*

Signature: Heather M Davis Date: 29 Sept 2016

Project Functional Manager (*I have read and commit to following the mitigations set out in this report)*

Name: Audrey Buchanan, *General Works Manager, CBFU*

Signature: AB Date: 29 Sept 2016

Approved by:

Name: Éric Le Bel, *Superintendent CBHNPC*

Signature: E Le Bel Date: 30 Sept 2016

Comment:

Approval for phase 1 (October 2016) - tree cutting by hand by Parks Canada staff when work could impact known cultural resources

APPENDIX 1

Effects Identification Matrix:

Trout Brook Campground Proposal

Effects Identification Matrix: ***Trout Brook Campground Proposal***

A.Direct Effects (during preparation/construction phases)													
			Components potentially directly affected by the proposed project										
			Natural Resources					Cultural Resources		Visitor Experience			
			Air	Soil & geology	Hydrology	Flora	Fauna	~ Landscapes	~ Resources	Visitor access	Recreational	Viewscapes	Soundscapes	Visitor Safety
	Phase	Associated Activities												
Project Components	Preparation / construction	Material storage	√	√	√	√	√					√	√	√
		Clearing	√	√	√	√	√			√	√	√	√	√
		Detour set up	√	√	√	√	√			√	√	√	√	√
		Waste disposal	√	√	√	√	√						√	√
		Dredging	√	√	√	√	√			√	√	√	√	√
		Drainage	√	√	√	√	√			√	√	√	√	√
		Excavation	√	√	√	√	√	√	√	√	√	√	√	√
		Grading	√	√	√	√	√	√	√	√	√	√	√	√
		Backfilling	√	√	√	√	√	√	√	√	√	√	√	√
		Machinery use	√	√	√	√	√	√	√	√	√	√	√	√
		Transport - materials & equipment	√	√	√	√	√			√	√	√	√	√
		Sedimentation	√	√	√	√	√	√	√	√	√	√	√	√
		Use of chemicals	√	√	√	√	√			√	√	√	√	√
		Temporary facilities	√	√	√	√	√			√	√	√	√	√
		Vehicle traffic	√	√	√	√	√			√	√	√	√	√
		Decommissioning	√	√	√	√	√			√	√	√	√	√
		Remediation	√	√	√	√	√			√	√	√	√	√