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PARKS CANADA AGENCY

M FORM BRIDGE RECONSTRUCTION LES CASCADES TRAIL

PCA Project: 45370817
SNC-Lavalin File: 637126

TECHNICAL SPECIFICATIONS ISSUED FOR TENDER

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September 2, 2016

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1. GENERAL

1.1 Work covered by the contract documents

- .1 The works covered by the present contract documents include the demolition and reconstruction of the M Bridge, in the Mauricie National Park.

1.2 Work by others

- .1 Co-operate with other Contractors (if applicable) in carrying out their respective works and carry out instructions from the Parks Canada Agency (PCA) Representative.
- .2 Co-ordinate work with that of other Contractors (if applicable). If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to the PCA Representative, in writing, any defects which may interfere with proper execution of Work.

1.3 Work done by PCA

- .1 PCA will take care of clearing, before construction, all furnishings, displays, as well as any interpretive panels in the zones of. All other furnishing will be left in place and protected by PCA. The contractor shall take care not to damage the furnishings left in place.

1.4 Contractor use of premises

- .1 Limit use of premises for work, for storage, for access, to allow:
 - .1 Occupancy by PCA;
 - .2 Work by other contractors (if applicable);
- .2 Co-ordinate use of premises under direction of PCA Representative. See supplementary instruction in section 01 14 00.
- .3 See figure 1 and 2 of section 01 14 00 for the zone reserved for the installation of the site trailer and the material storage. This zone must be fenced off with a temporary construction fence. Grassed surfaces must be covered with a type V geotextile according to MTMDET standards, followed by the addition of granular material. The Contractor must restore

to original state the zone following the works and remove the granular material added on top of the natural soil, without damaging the geotextile, Then he must remove the geotextile. Following the work, the surface must not be covered with sod plaques or grass seed. The contractor must rebuild the paved or gravelled foot paths affected by the works. Electricity is available in this area.

- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .5 The contractor must install a fence around the PCA building to protect the construction site and storage area. The access to the inside of the fenced area must be limited to a minimum and be closed when not used for work purposes.
- .6 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .7 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by PCA Representative.
- .8 At completion of operations condition of existing work: equal to or better than that which existed before new work started. This includes the grassed areas and paved or graveled areas. All damages to the paved or gravelled roads caused by the construction shall be repaired by the contractor to the satisfaction of the PCA Representative.

1.5 Use of premises – Particular conditions

- .1 In general, the operations of the PCA are prioritized to those of the Contractor. Under no circumstances shall the Contractor interfere or interrupt the operations of the PCA. The Shewenagan picnic sector (work site) is closed from October 11 2016 to the end of April 2017. The Park remains open all year and the service road will have snow-removal up to the site of the PCA works.
- .2 The Contractor and his subcontractors must notify the PCA Representative of the date and time of any delivery vehicle and details beforehand. If necessary, the Contractor shall provide a staff member for the reception of the goods.
- .3 Use of the site is restricted to the zone of work necessary for the construction, storage of material and access to the construction site. The

contractor must maintain for the entire length of work, and at all times, a safe access to the work site.

1.6 Occupancy by Parks Canada Agency

- .1 The buildings of the Shewenagan picnic area may not be used by the contractor during the works.
- .2 The Contractor must take into account that the park will remain active during the construction period. The Contractor must determine a work methodology to do the work without affecting the daily operations of the park. The immediate area surrounding the work site will however be closed but visitors may be present.
- .3 Collaborate with the PCA Representative when establishing the work schedule, so as to reduce conflicts and facilitate the use of the premises by PCA.
- .4 Execute the work by bothering as little as possible the use of the park, the occupants, the public and the normal use of the site. Make necessary arrangements with the PCA representative to facilitate the execution of the work.

1.7 Scope of Work

- .1 Without being limited to, the following list describes the scope of work to be performed. Complete the work in detail to deliver a complete, functional and efficient installation. Unless otherwise indicated, the work includes supply, installation and connection material as well as the dismantlement of identified existing works.
 - .1 Protect the environment during the work.
 - .2 Clear wood and shrubs as required for the execution of the work.
 - .3 Construct accesses and temporary works in wet areas.
 - .4 Excavate in order to execute the reconstruction work of M bridge.
 - .5 Demolish completely the wood structure of the M bridge and the foundations on the shore of the lake, while conserving the center foundation element identified on the drawings.
 - .6 Construct the foundations on the shore of the lake.

- .7 Repair and modify the existing foundation identified on the drawings.
- .8 Construct the wood structure of the bridge as well as its deck.
- .9 Backfill any excavations.
- .10 Dismantle the access and the temporary works in wet areas.
- .11 Profile the slopes, clean and return the surfaces to their former state.
- .2 As specified in the plans.
- .3 As the work progresses, the Contractor shall rid the site of demolition debris at his own expense and dispose of it off site. At the end of the work, the Contractor must pick up all that remains and clutters the site, including excess waste; He must leave the premises clean and undefiled.
- .4 The Contractor shall return in their original state, the areas and sectors used during construction. He must take knowledge of the nature and scope of patching work and perform all of the patching work necessary. Perform the finishing patching work using the same materials, colours, finishes and laying methods as the existing adjacent finishes.

1.8 Plans and technical specifications

- .1 Consider the plans and technical specifications as complementary and that all that appears either on the plans or in the technical specifications shall be included on the plans and in the technical specifications.
- .2 Determine the exact location on site of all equipment that does not appear on the drawings.
- .3 Notify the PCA Representative of any errors or omissions it finds in the plans and in the technical specifications, as well as any incompatibility and that, before the delivery of the bid.
- .4 Consider that the PCA Representative reserves the right to interpret the plans technical specifications.

1.9 Documents required

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

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

1.10 Site meetings

- .1 Weekly project meetings are to be held throughout the progress of the work, as requested by the PCA Representative. Ensure the management of these meetings.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Not used

- .1 Not used.

1. GENERAL

1.1 Access and Egress

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, lanes, temporary bridge over watercourse, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .2 The circulation on the site must be done within the zones planned for this use (see figures 1 and 2 at the end of this section). No machinery may circulate beyond the designated zones without authorization of the PCA Representative.
- .3 In the case where it is not possible to stay within the limits and that approval is given by the PCA Representative, protective measures must be put in place by the contractor at his expense.

1.2 Use of Site and Facilities

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with PCA Representative to facilitate work as stated.
- .2 Maintain existing services to public and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Closures: protect work temporarily until permanent enclosures are completed.

1.3 Existing Services

- .1 Provide for pedestrian and vehicular traffic for PCA staff.
- .2 The Contractor must consider in establishing its working methods that the bridge on the path between the parking and picnic area has a capacity of 24 000 kg for a tandem axle 12 000 kg for a single axle.
- .3 The contractor may move the bins, tables, fences, signs and other equipment of the PCA present in the work area. The Contractor must

replace, before 12 May 2017, all items that were moved to carry out the work.

1.4 Special Requirements

- .1 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.

1.5 Security

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

1.6 Building Smoking Environment

- .1 Comply with smoking restrictions. Smoking is not permitted.

1.7 Grass

- .1 The turf, the trees and other green zones around the construction site must be protected at all times during the construction work.

2. PRODUCTS

2.1 Not used

- .1 Not Used.

3. EXECUTION

3.1 Not used

- .1 Not Used.

Figure 1 :



Figure 2 :



1. GENERAL

1.1 References

- .1 Owner/Contractor Agreement.
- .2 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET).
 - .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.
- .3 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-1994, Stipulated Price Contract.

1.2 Method of Payment

- .1 Worksite organisation
 - .1 The site organization is paid at a flat overall price. The price shall cover the access roads, local site and temporary facilities for the needs of the site, the video survey before beginning work and maintenance of the premises, and includes any incidental expense.
- .2 Measures for environmental protection
 - .1 Environmental protection works required are paid at a flat overall price. The price covers the provision of materials and labour, and includes any incidental expense.
- .3 Cofferdam works at the D pile
 - .1 Cofferdams are paid at a flat overall price. The price covers in particular the supply of materials, the implementation, the inspection using a video camera, the removal of the cofferdam and the rehabilitation of the lake bed to restore it to previous state before the work and includes any incidental expense.
- .4 Access to the west shore
 - .1 Access to the west bank is paid at a flat overall price. The price covers in particular the supply of materials, implementation, maintenance, removal and demolition reordering of the premises, and includes any incidental expense.
- .5 Demolition of existing structures (complete or partial)
 - .1 The complete demolition of a structure or part of a work is paid at a flat overall rate. The price includes especially excavations, filling of

excavations, supply of equipment, implementation and disposal of demolition materials, and includes any incidental expense.

- .2 Any costs incurred by the contractor for carrying out the partial demolition of a structure, including in particular the cost of excavation, filling of excavations, supply of equipment, implementation, preparation of concrete surfaces to maintain the cleaning of the existing structure as well as the disposal of demolition materials are included in the unit prices or lump sums for which the demolition is required.
- .6 Excavation, 1st class, including filling
 - .1 The first class cuts are paid in accordance with section 11.4.3.4 du CCDG. The price includes filling of the excavations.
- .7 Excavation, 2nd class, including filling
 - .1 The 2nd class excavations are paid at a flat overall rate. However, the excavated material cannot be reused. The price covers the preparation and drying of the bottom of excavations, loading, transportation, disposal and filling excavations to the level of final surrounding soil. The price includes the implementation and any incidental expenses.
- .8 Granular materials support pad
 - .1 The pad of granular material is paid per cubic meter according to the theoretical dimensions of the excavations (see CCDG). The price covers the supply of materials and implementation, and includes any incidental expense.
- .9 Concrete support pad
 - .1 The concrete pad is paid per cubic meter according to the theoretical dimensions of the excavations. The price covers the supply of materials and implementation, and includes any incidental expense.
- .10 Foundations (abutments and piles)
 - .1 The construction of the A, B, D, F and G foundation units is paid at a flat overall price. The price includes the supply of materials, implementation and includes any incidental expenses.
- .11 Glued Laminated Timber
 - .1 The construction of the wood frame in Glulam timber is paid at a flat overall price. The price includes the supply of materials, assembly design, and implementation and includes any incidental expenses.

- .12 Galvanized and painted steel connections
 - .1 Construction of galvanized steel connections and bearings is paid at a flat overall price. The price includes the supply of materials, implementation and includes any incidental expenses.
- .13 Wood decking
 - .1 The construction of wood decking is paid at a flat overall price. The price includes the supply of materials (including the waterproofing membrane), the implementation and includes any incidental expenses.
- .14 Wood railings
 - .1 The construction of the wooden railing is paid at a flat overall price. The price includes the supply of materials, implementation and includes any incidental expenses.
- .15 Restoration of the work area, including the paving of paths
 - .1 Cleaning and restoration of the area are paid at a flat overall price. The price includes the supply of materials, implementation, reinstallation of park equipment moved temporarily for the work (tables, bins, information panels, etc.) and includes any incidental expenses.

1.3 Applications for Progress Payment

- .1 Refer to CCDC 2.
- .2 Make applications for payment on account monthly as Work progresses.
- .3 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .4 Submit to PCA Representative at 7 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment.

1.4 Schedule of Values

- .1 Refer to CCDC 2.
- .2 Provide schedule of values supported by evidence as the PCA Representative may reasonably direct and when accepted by the PCA Representative, be used as basis for applications for payment.

- .3 Include statement based on schedule of values with each application for payment.
- .4 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as the PCA Representative may reasonably require to establish value and delivery of products.

1.5 Preparing Schedule of Unit Price Table Items

- .1 Submit separate schedule of unit price items of Work requested in Bid form.
- .2 Make form of submittal parallel to Schedule of Values, with each line item identified same as line item in Schedule of Values. Include in unit prices only:
 - .1 Cost of material.
 - .2 Delivery and unloading at site.
 - .3 Sales taxes.
 - .4 Installation, overhead and profit.
- .3 Ensure unit prices multiplied by quantities given equal material cost of that item in Schedule of Values.

2. PRODUCTS

2.1 Not used

- .1 Not Used.

3. EXECUTION

3.1 Not used

- .1 Not Used.

END OF SECTION

1. GENERAL

1.1 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 PCA Representative to enable monitoring of project work in relation to established milestones.

1.2 Requirements

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to allow for progress reporting.
- .4 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.
- .5 All the work of the present contract must be completed by May 1, 2017.

1.3 Action and Informal Submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress
- .3 Submit Project Schedule to PCA Representative within (5) working days of receipt of acceptance of Master Plan.

1.4 Project milestones

- .1 Project milestones form interim targets for Project Schedule.

1.5 Master Plan

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 PCA Representative will review and return revised schedules within (5) working days.
- .3 Revise impractical schedule and resubmit within (5) working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 Implementation schedule

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes at least the milestone and activity types as follows:
 - .1 Award
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Dismantling of various works/tasks.
 - .6 Installation ou construction of different tasks.
 - .7 Testing and Commissioning

1.7 Project Schedule Reporting

- .1 Update Project Schedule once a month reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, once a week, 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.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

2. PRODUCTS

2.1 Not used

.1 Not used.

3. EXECUTION

3.1 Not used

.1 Not used.

1. GENERAL

1.1 Administratives

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

1.2 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 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.
- .3 Allow 5 days for PCA Representative review of each submission.
- .4 Adjustments made on shop drawings by PCA Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to PCA Representative prior to proceeding with Work.
- .5 Make changes in shop drawings as PCA Representative may require, consistent with Contract Documents. When resubmitting, notify PCA in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project Title and Number.
 - .3 Contractor's name and address.
 - .4 La désignation de la section du devis et de l'article aux quelles font référence chaque dessin.
 - .5 Identification and quantity of each shop drawing, product data and sample.
 - .6 Other pertinent data.
- .7 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.

- .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication;
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances;
 - .3 Setting or erection details;
 - .4 Performance characteristics.
 - .5 Standards;
 - .6 Operating weight;
- .8 After PCA Representative's review, distribute copies of shop drawings and technical documents.
- .9 Supplement standard information to provide details applicable to project.
- .10 If upon review by the Representative of PCA, no errors or omissions are discovered or if only minor corrections are made, 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.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Not used

- .1 Not used.

1. GENERAL

1.1 References

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Quebec
 - .1 An Act Respecting Occupational Health and Safety, R.S.Q., c.S-2.1 (current edition).

1.2 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within (7) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit two copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, weekly, to PCA Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 PCA Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within three days after receipt of plan. Revise plan as appropriate and resubmit plan to PCA Representative within three days after receipt of comments from PCA Representative.
- .7 PCA Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

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

1.3 Filing of Notice

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award. Contractor to submit written acknowledgement to CNESST along with Ouverture de Chantier Notice.
- .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.

1.4 Safety Assessment

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

1.5 Meetings

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

1.6 General Requirements

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

1.7 Responsibility

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

- .2 Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.8 Compliance Requirements

- .1 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 Unforeseen Hazards

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

1.10 Posting of Documents

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

1.11 Correction of Non-compliance

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

1.12 Work Stoppage

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

2. PRODUCTS

2.1 Not used

.1 Not used.

3. EXECUTION

3.1 Not used

.1 Not used.

1. GENERAL

1.1 Fire Department Briefing

- .1 PCA Representative will coordinate arrangements for contractor for briefing on Fire Safety at pre-work conference by Fire Chief before work is commenced.

1.2 Reporting Fires

- .1 Know location of nearest fire alarm box and telephone, including emergency phone number.
- .2 Report immediately fire incidents to Fire Department as follows:
 - .1 Activate nearest fire alarm box; or
 - .2 Telephone.
- .3 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location.

1.3 Interior and Exterior Fire Protection and Alarm Systems

- .1 Fire protection and alarm system must not be:
 - .1 Obstructed;
 - .2 Shut-off; and stopped
 - .3 Left inactive at end of working day or shift without authorization from Fire Chief.
- .2 Fire hydrants, standpipes and hose systems will not be used for other than fire-fighting purposes unless authorized by Fire Chief.

1.4 Fire Extinguishers

- .1 Supply fire extinguishers, as scaled by Fire Chief, necessary to protect work in progress and contractor's physical plant on site.

1.5 Blockage of Roadways

- .1 Advise Fire Chief of work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by Fire Chief, erecting of barricades and digging of trenches.

1.6 Smoking Precautions

- .1 Observe smoking regulations.

1.7 Rubbish and Waste Materials

- .1 Keep rubbish and waste materials at minimum quantities.
- .2 Burning of rubbish is prohibited.
- .3 Removal:
 - .1 Remove rubbish from work site at end of work day or shift or as directed.
- .4 Storage:
 - .1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.
 - .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove specified.

1.8 Flammable and Combustible Liquids

- .1 Handling, storage and use of flammable and combustible liquids governed by current National Fire Code of Canada.
- .2 Keep flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires permission of Fire Chief.
- .3 Transfer of flammable and combustible liquids is prohibited within buildings or jetties.
- .4 Transfer of flammable and combustible liquids will not be carried out in vicinity of open flames or any type of heat-producing devices.
- .5 Do not use flammable liquids having flash point below 38 degrees C such as naphtha or gasoline as solvents or cleaning agents.

- .6 Store flammable and combustible waste liquids, for disposal, in approved containers located in safe ventilated area. Keep quantities minimum and Fire Department is to be notified when disposal is required.

1.9 Hazardous Substances

- .1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, in accordance with National Fire Code of Canada.
- .2 Obtain from Fire Chief a "Hot Work" permit for work involving welding, burning or use of blowtorches and salamanders, in buildings or facilities.
- .3 When Work is carried out in dangerous or hazardous areas involving use of heat, provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of Fire Chief. Contractors are responsible for providing fire watch service for work on scale established and in conjunction with Fire Chief at pre-work conference.
- .4 Provide ventilation where flammable liquids, such as lacquers or urethanes are used, eliminate sources of ignition. Inform Fire Chief prior to and at cessation of such work.

1.10 Questions and/or Clarifications

- .1 Direct questions or clarifications on Fire Safety, in addition to above requirements, to Fire Chief.

1.11 Fire Inspection

- .1 Coordinate site inspections by Fire Chief through PCA Representative.
- .2 Allow Fire Chief unrestricted access to work site.
- .3 Cooperate with Fire Chief during routine fire safety inspection of work site.
- .4 Immediately remedy unsafe fire situations observed by Fire Chief.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Not used

.1 Not used.

1. GENERAL

1.1 References

- .1 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. The prevention of pollution and damage to the environment covers the protection of soil, water, air, biological and cultural resources; it also includes the management of visual aesthetics, noise, solid waste, chemicals, gases and liquids, radiant energy, radioactive substances and other pollutants.
- .2 References
 - .1 « U.S. Environmental Protection Agency (EPA)/Office of Water »
 - .1 EPA 832/R-92-005-92, « Storm Water Management for Construction Activities, Chapter 3 ».
 - .3 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET)
 - .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.

1.2 Fires

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

1.3 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 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

1.4 Notification of Noncompliance

- .1 The PCA 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 the PCA Representative of proposed corrective action and take such action for approval by the latter.
 - .1 Take action only after receipt of written approval by the PCA Representative.
- .3 The PCA 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.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 General

- .1 Establish an environmental protection plan that shows the different stages of implementation, the nature and extent of work required. The Environmental Protection Action Plan to be presented to the PCA representative for approval. The action plan should contain:
 - .1 Environment manager identification (organisation chart of the communication on the work site);
 - .2 Information meeting to convey the environmental requirements to the project workers. This meeting is under the responsibility of the contractor and, if necessary, the PCA representative of will be on hand to answer questions;

- .3 Work schedule;
 - .4 Indication of the sites requiring physical demarcation (tape, fence, etc.) and shorelines of rivers and lakes where the vegetation must be retained. The final demarcation of the perimeter of the work will be conducted with officials of the Park;
 - .5 Identification of trenches that need to be diverted to vegetation zones;
 - .6 Use and combination of erosion control methods prescribed in this quotation for the work, storage areas and waste areas;
 - .7 Areas forecast to stabilize immediately and cover with geotextile membranes or erosion control blankets;
 - .8 Setting up and dismantling of the of the works in wet lands;
 - .9 Plans for falsework;
 - .10 Weather monitoring;
 - .11 Management plan for waste areas or other sites used beyond the road allowance (volume of spread materials, access roads, land used, quality of the underlying soils, river location and lakes, tree protection, landscaping, etc.);
 - .12 Method of intervention in case of spillage of petroleum products;
 - .13 Management of contaminated materials, if required;
 - .14 Noise management;
 - .15 Planning for the suspension of work during the winter;
 - .16 Device to prevent fish from ending up in the pumping system;
 - .17 etc.
- .2 Ensure waterways and public storm and sanitary sewers remain free of waste and volatile material is removed.
 - .3 Prior to the work, provide an information meeting with stakeholders to present environmental concerns, specific requirements and mitigation

measures to be in place for the smooth execution of work and the protection of the wood turtle .

- .4 Identify the person in charge of environmental monitoring during construction, implementation of mitigation and site safety measures.
- .5 Avoid unnecessary encroachment of the work area in the receiving environment.
- .6 Favour the use of ecological lubricants (biodegradable) in the use of mechanical equipment. For work performed along the shore and in aquatic areas with mechanical equipment, use only environmentally friendly lubricants (biodegradable).
- .7 Use and maintain the various mechanical equipment in good condition to avoid any leakage of grease, oil or fuel. Service and supply of lubrication and refueling of equipment in a suitable area (service area) located more than 60 m from any aquatic environment..
- .8 During the suspension of work and the absence of workers on the site, remove all equipment operated with hydrocarbons and containers connected to the outside more than 60 m from any aquatic environment. At all times store such equipment and containers in receptacles for the recovery of 150% of the volume of hydrocarbons stored.
- .9 Provide an emergency plan and the necessary equipment on site at all times during the work to contain and recover any oil spill and toxic products. Evacuate all product and contaminated soil according to the existing provisions in the park (recycling bins for materials contaminated with hydrocarbons, accredited storage sites for contaminated soil management). Contaminated soil must be quantified and recovered. Proof of transport at an authorized site must be provided to the PCA representative.
- .10 As stipulated in Article 10.4.2 of the CCDG, the contractor must have permanently on site an oil product recovery emergency kit for each of the work sites. Kits should include enough absorbent roller, absorbent material and containers to intervene across the width of the river or to confine the oil products within the scope of the machinery in question, by including a floating boom. The kits should be available near the rivers and machinery, and must be easily accessible at all times for rapid response.

- .11 The contractor shall immediately inform the PCA Representative, the Park authorities and Urgence Environment, of any accident that may disturb the environment, such as oil spills. Emergency numbers:
 - .1 Mauricie National Park (819) 536-2638.
 - .2 PCA Project Manager (819) 247-0374;
- .12 Avoid using heavy machinery in areas susceptible to surface erosion and landslide and pay special attention to river banks, wetlands and lakes. It is prohibited to operate heavy machinery in the coastal streams, lakes and wetlands.
- .13 Keep the machinery away from the river as soon as it is no longer used. Also, evenings and weekends, store the heavy machinery over twenty (20) meters away from of the river.
- .14 Put in place the necessary measures to prevent the fall of debris, materials and equipment on the shoreline and in Lake Wapizagonke during construction.
- .15 Maintain constant vigilance during the repair work and inform without delay the PCA Representative as soon as a turtle is observed in the work area and suspend or move jobs when turtle is present and exposed to danger in the area covered by the work time that the protection and relocation measures are put in place by the stakeholders of the park.
- .16 Perform cleaning as per Section 01 74 11 - Cleaning.

3.2 Protection of Watercourses, Wetlands and Lakes

- .1 In addition to complying with the requirements of Article 10.4 of CCDG, the Contractor shall comply with the provisions of this specification. These safeguards are intended to reduce erosion and sedimentation in rivers and protect the wildlife habitat. The specific terms related to the different elements of rivers are shown in standardized drawing in appendix 1.
- .2 Wherever work is undertaken and results in destabilizing the soil, it is the contractor's responsibility to plan the drainage system of these disturbed areas and provide temporary stabilization measures and sediment collection devices before their routing in rivers, lakes and wetlands. The devices must be installed at the exit of the reprofiled ditches, culverts and where water flows on the site temporarily or continuously. These devices are sediment barriers, sedimentation basins or other effective technique (devices illustrated in appendix 2, 3 and 4). The contractor must present a

- drainage plan and erosion control to the supervisor ten (10) days before the start of the work which could lead to the flow of sediment into rivers, lakes and wetlands.
- .3 Using an embankment pier is forbidden to access the central foundation and the west bank (to Les Cascades trail) Lake. The Contractor must use barges for work.
 - .4 Pursuant to section 10.4.3.2.2 of EGDC and Schedule 2 attached, the contractor must install sediment barriers at the foot of the slopes with unstable soils to avoid the flow of sediment into rivers, lakes and wetlands. On the edge of watercourses with a slope with a length of ten (10) meters and more, the contractor will install a second sediment barrier in sloped areas. Damaged and/or buried sediment barrier sections must be replaced or cleaned when necessary.
 - .5 Pursuant to section 10.4.3.2.3 of CCDG and appendix 3, the contractor shall install settling ponds during the pumping work in cofferdams, to avoid the sediment in watercourses, wetlands or lakes. The minimum capacity of a pool is calibrated according to the flow of water pumped. It is prohibited to install these devices in the shoreline of a river, lake or wetland. When a sedimentation tank is 50% full, it must be cleaned. In addition, a final cleaning must be carried out in the temporary closure of a site and the permanent closure. Preventive cleaning should also be done if a weather alert announces a heavy rain. The bottom of sedimentation ponds should not be lower than the natural terrain.
 - .6 Water from the dewatering of excavations and cofferdams has to be evacuated to an area of vegetation (forest bed) at more than thirty (30) meters of the river. It is the contractor's responsibility to put adequate measures in place to avoid erosion and sedimentation at the point of discharge.
 - .7 On slopes subject to surface erosion, especially on the shores, the contractor must establish temporary protection measures. These will prevent sediment flow into the river, lake or other body of water. Geotextile membranes should be placed for the temporary stabilization. Plastic membranes (polyethylene) are prohibited. Their temporary or permanent storage should be carried out in preselected locations at least thirty (30) meters from water.
 - .8 Repair and modification of the central foundation in the lake must be done in dry conditions and requires the use of a cofferdam. The materials used for the cofferdam should be clean and without fine materials. Cofferdams

built using fine materials are not accepted, even if they are contained in a geotextile membrane. Granular materials used for work must not come from the bed of a river, a lake, or their bank. Thus the second paragraph of Article 15.2.2 of CCDG is removed. In order to evaluate the height of the cofferdam, the contractor must give the PCA Representative probable water levels, including water levels resulting from heavy rain during the construction period. The contractor must provide for the use of temporary structures designed based on assessed water levels. If the construction site is isolated by a cofferdam and pumping seepage is necessary, they must be removed, as stipulated in the article 10.4.3.2 CCDG. In addition, pumping water discharged to the watercourse must contain less than 25 mg/l of suspended solids. Upon completion, the removal of the cofferdam is completed so as to restore the river to its original section and granularity characteristics and profile that existed before the work. In this sense, the entrepreneur, who made a bathymetric survey before the work began, has the information required to restore the stream bed.

- .9 When working at the central foundation in the lake, use of turbidity curtains around the work area is required.
- .10 From October 15, the contractor must temporarily stabilize all sensitive surfaces from surface erosion and the sections occupied by falsework before the first snowfall. To do this, he must stabilize sensitive surfaces with geotextile membrane and riprap up to the natural high water mark (HWM).
- .11 The Contractor must use natural stone, clean, round and neutral color for riprap, protective armour and to restore the bed of the water within the natural high water. In addition the contractor will stabilize and return to their original state banks that were perturbed by the work.

3.3 Wood Clearing

- .1 Wood clearing is limited to authorized areas necessary for carrying out the work
- .2 The accurate identification of the area to be cleared (carried out jointly with the Park authorities), by marking and tagging is mandatory. The markup plan of areas to be cleared shall be submitted to the supervisor for approval before the clearing.
- .3 Wood clearing is manually executed so that the base of the felled trees is as far as possible from waterways. No trees or cutting residue shall fall

into the river. If this is the case, the debris is removed manually by causing the least possible inconvenience to the streambed and banks.

3.4 Protection Against Noise

- .1 In addition to measures already planned in the CCDG at article 10.4.4, the contractor must monitor noise levels during the construction phase by the application of the following measures:
 - .1 The schedule of transportation and use of the machinery must comply with the regulations of the municipalities and the regional county municipality (MRC);
 - .2 The equipment and heavy machinery are maintained in good working condition (adequate mufflers, regular maintenance, etc.) to keep them to the lowest possible noise level;
 - .3 Operation of any motorized vehicle is stopped if it is not used for a certain period of time (eg lunch break and another breaks, etc.);
 - .4 As much as possible, stationary equipment should be located away from locations sensitive to noise to reduce the impact caused on the ambient noise level;
 - .5 Noise attenuation devices, which accompany some equipment (for example, closable side panels of the compressors, etc.) must be used. Deforestation is limited to authorized areas necessary for carrying out the work.

3.5 Restoration of Disturbed Soils and Final Stabilization

- .1 When the work is completed, the contractor proceeds with the implementation of recovered topsoil and placed in reserve at the beginning of the work (no imports of topsoil on the park territory will be permitted), to cover the disturbed soil surfaces. If a delay is necessary, erosion control devices must remain in place to capture any eroded material.
 - .1 Restore to original condition, the bed and banks of watercourses.
 - .2 The final stabilization will be performed with erosion control blankets. See Appendix 5.

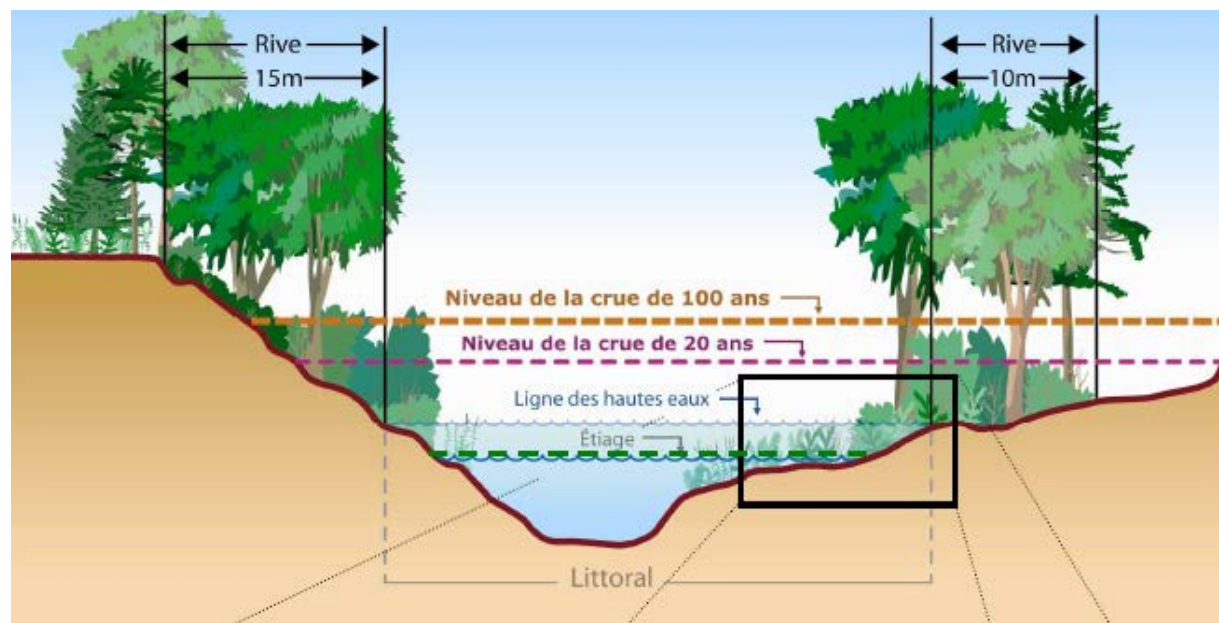
3.6 Prohibited Practice in the National Park

- .1 To protect the ecological integrity of the National Park, some items have been removed from CCDG and specifications standards:
 - .1 Backfill concrete or asphalt recycled: Articles 4.2.2 and 11.6.1.5;
 - .2 Landscaping: Chapter 18 (including the use of straw as a temporary stabilization means and straw bales to replace silt fences);
 - .3 Use only water as a dust suppressant: Article 12.4;
 - .4 No fording of rivers: Article 10.4.3.4;
 - .5 No temporary diversion of watercourses is permitted: Article 6.6.3.

3.7 Responsibility for Costs

- .1 In addition, any expense related to damage caused to the environment is at the expense of the contractor in particular as regards the characterization and analysis expertise as well as wildlife habitat improvement works replacement and indemnities.
- .2 In case of non-performance by the contractor to repair damage, PCA will perform the repair work and is payable by the contractor the cost of the work and delays by withholding payments.

Appendix 1 - LEXICON



Berge = Bank : Edge portion more or less steep of a running or standing water, and may be or being submerged without the water overflowing.

Cours d'eau = Watercourse: any body of water that flows into a bed with a constant or intermittent flow, including those that were created or modified by human intervention, and the St. Lawrence River and the Gulf of St. Lawrence, as well as all the seas around Quebec, with the exception of public or private road ditches, common ditches and drainage ditches.

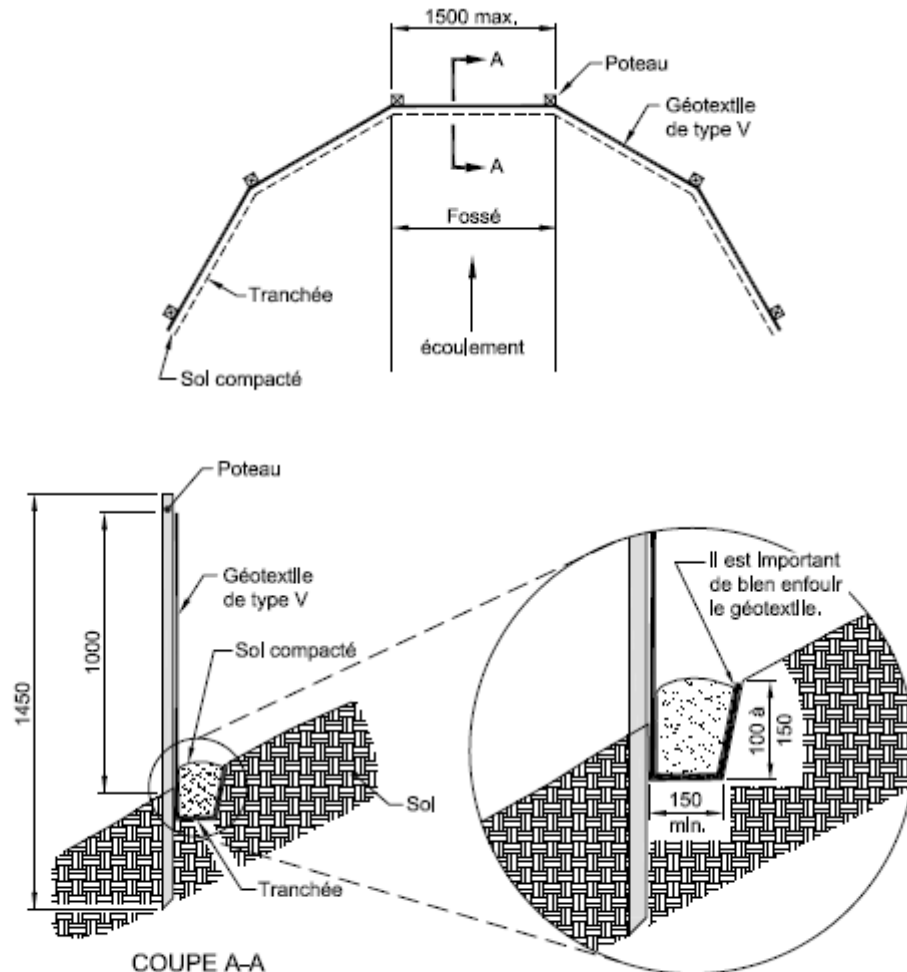
Ligne naturelle des hautes eaux (LNHE) = Natural High Water Mark (HWM) : is the place where you change from a predominance of aquatic plants to a predominance of terrestrial plants or, if there is no aquatic plants, the place where terrestrial plants stop towards the water body

Littoral = Littoral : portion of land between the high water (HWM) and the lower limit of submerged plants.

Milieu hydrique = Water Environment (or Wetland): constant or intermittent watercourse, lake, pond, marsh, swamp or bog.

Rive (bande riveraine) = Bank (riparian): the bank is a strip of land bordering lakes and watercourses and extends inland from the high water line. The width of the shore protection is measured horizontally. The bank has a minimum of 10 meters when the slope is less than 30% or when the slope is greater than 30% with a bank less than 5 m high. The bank has a minimum of 15 meters when the slope is continuous and greater than 30% or when the slope is greater than 30% with a bank over 5 m high. The width of the bank could be greater if the development plan and the MRC of development prescribes it.

APPENDIX 2 – SEDIMENT BARRIERS

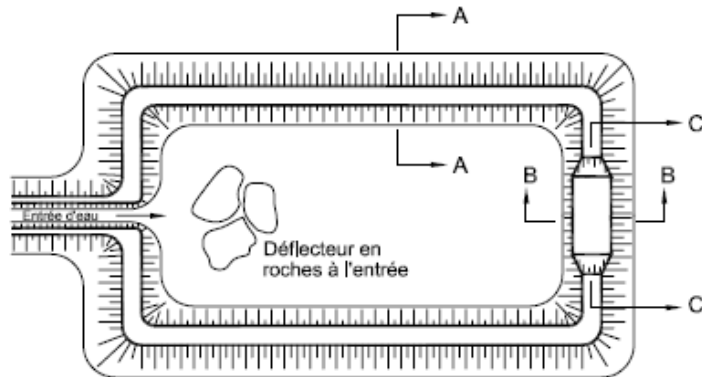


Note :

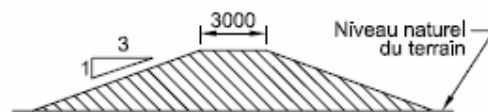
- les cotes sont en millimètres.

Installation of a sediment barrier with geotextile membrane.

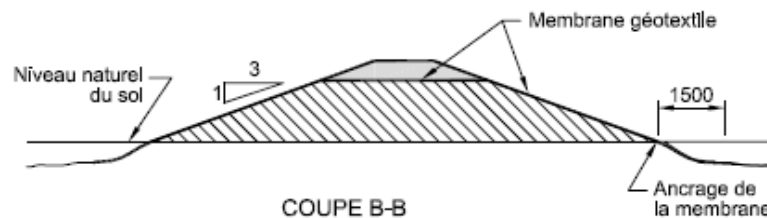
APPENDIX 3 – SETTLING PONDS



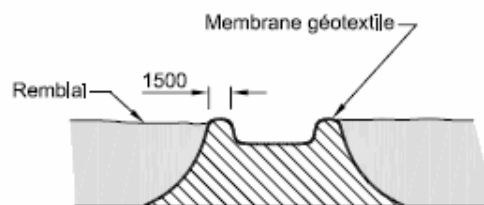
Bassin de sédimentation



COUPE A-A



COUPE B-B



COUPE C-C

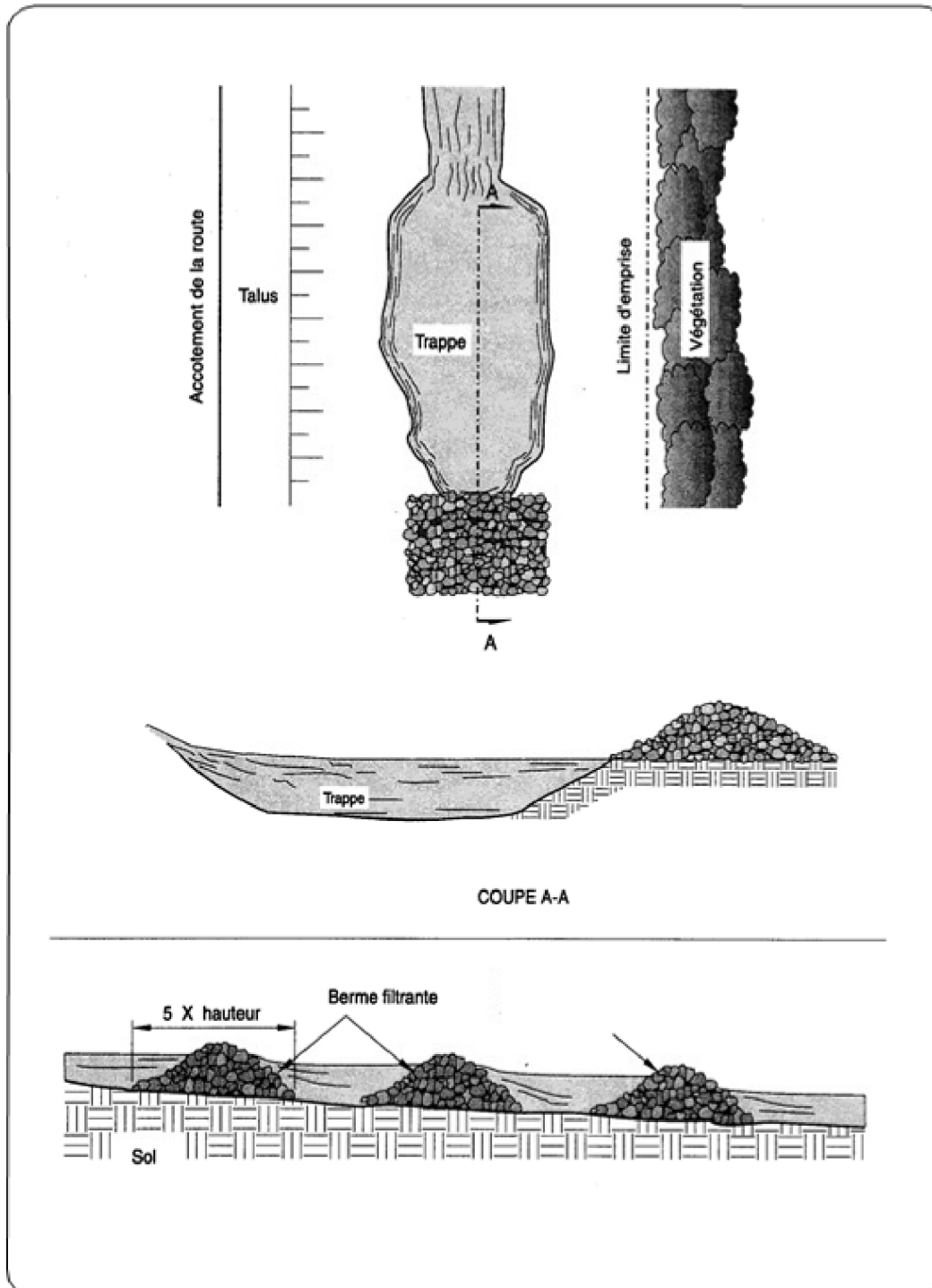
Déversoir sortie d'eau en pierre

Notes :

- cet ouvrage doit être planifié et prévu dans les plans et devis;
- l'emprise nécessaire à son installation doit être prévue et acquise à cette fin, le cas échéant.

SETTLING POND

APPENDIX 4 – FILTERING BERM AND SEDIMENT TRAP

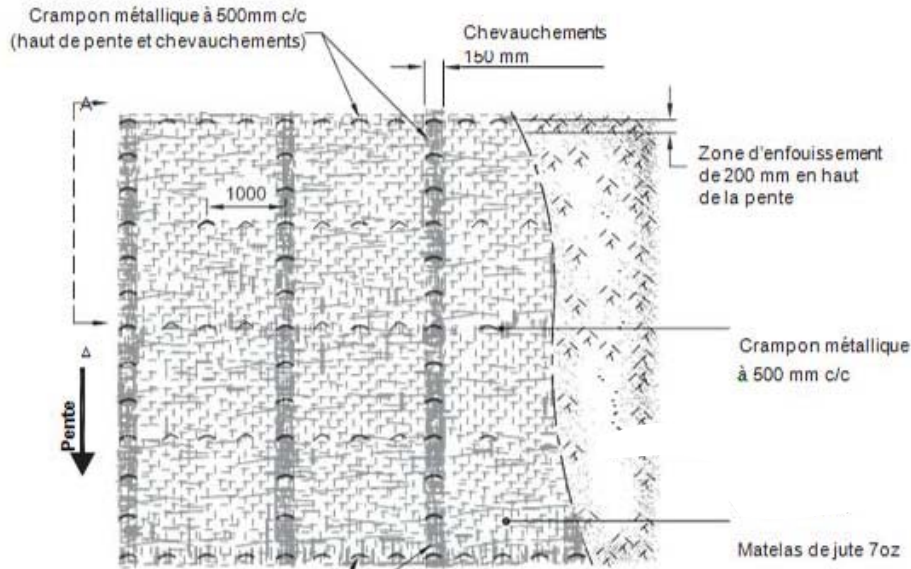


APPENDIX 5 – ANTI-EROSION MATTRESS

INSTALLATION METHOD OF MATTRESS ANTI-EROSION:

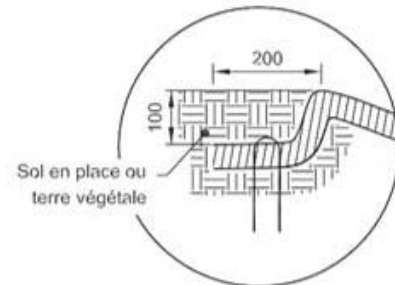
- Level the slope and topsoil, fill all voids and smooth to remove any recess or protrusion.
- Install 7 ounces jute mattress;
- Unroll the mattress starting at the top of the slope;
- Bury the mattress in the top of the bank and secure it firmly with staples "U" with a length of 15 mm to 60 cm planted c/c;
- Fix thereafter the regular staples of about 500 mm c/c and more tightly on steep slopes;
- Make sure the mattress is always in contact with the ground: not too soft mattress;
- Overlap the seams of mattresses, respecting the direction of flow of water, a minimum of 150 mm in moderate slopes and 300 mm in the bottom of a ditch and on steep slopes.

MATELAS ANTI-ÉROSION

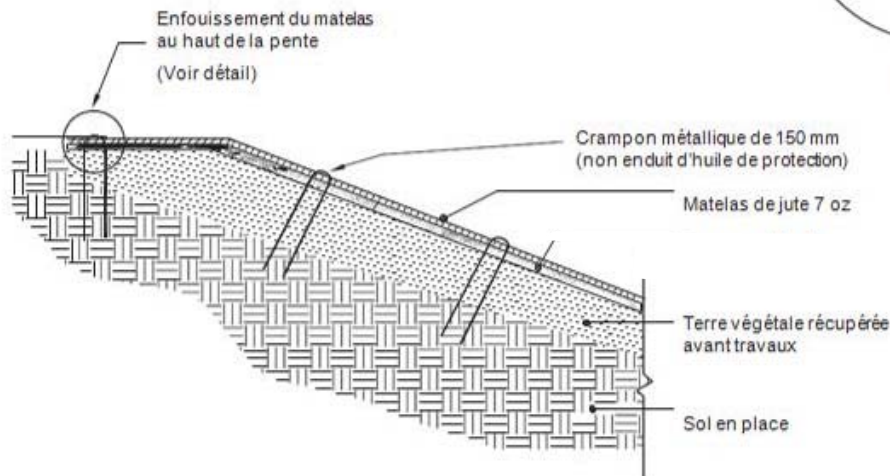


Crampon métallique à 500mm c/c (haut de pente et chevauchements)

Vue en plan



Détail

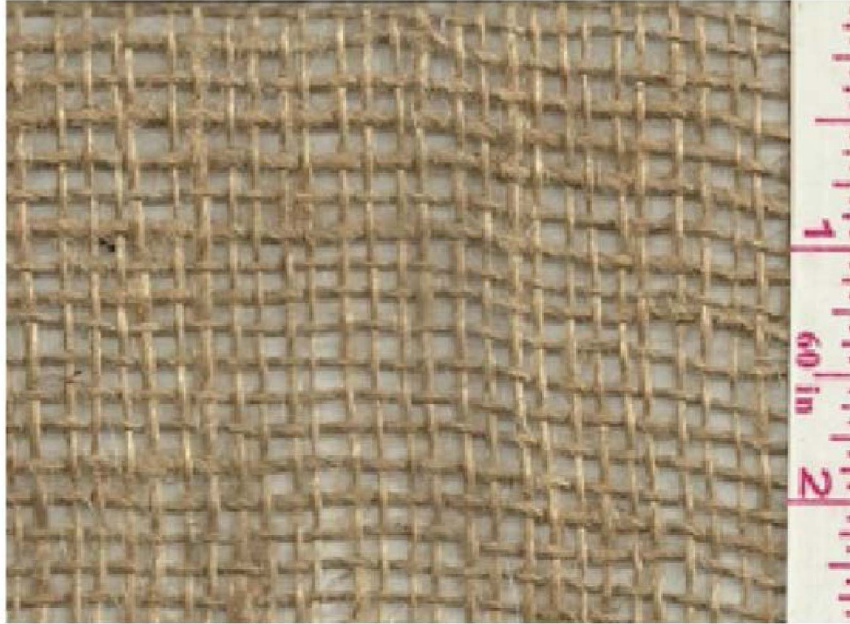


Coupe A-A

Remarque:

Toujours installer les rouleaux dans le sens de l'écoulement de l'eau.

Grosneur des mailles pour le matelas de jutes de 7 oz



|

1. GENERAL

1.1 Inspection

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

1.2 Procedures

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

1.3 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 the PCA 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 PCA Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by the PCA Representative.

1.4 Reports

- .1 Submit one (1) copy of inspection and test reports to the PCA Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

1.5 On-site Tests

- .1 Submit the certificates of the tests carried out at the site which are required in the various sections of the specification.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Not used

- .1 Not used.

1. GENERAL

1.1 References

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2- (current edition), Stipulated Price Contract.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189 – (current edition), Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59 – (current edition), Alkyd Exterior Gloss Enamel.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2- (current edition), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121(current edition), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2(current edition), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321(current edition), Signs and Symbols for the Occupational Environment.
- .4 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

1.2 Action and Informational Submittals

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

1.3 Installation and Removal

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

- .2 Identify areas which have to be gravelled over a geotextile membrane to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Dismantle and remove from site all facilities when no longer required.

1.4 Scaffolding

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, platforms and temporary stairs.

1.5 Hoisting

- .1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists/cranes to be operated by qualified operator.

1.6 Site Storage/Loading

- .1 Refer to CCDC 2, GC 3.12.
- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.7 Construction Parking

- .1 Parking will be permitted on site provided it does not disrupt performance of Work. The parking areas for the workers will be defined by PCA.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

1.8 Offices

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
- .4 PCA Representative's Site office.
 - .1 Provide temporary office for PCA Representative.
 - .2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
 - .3 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.
 - .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.
 - .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10 % upward light component.
 - .6 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one drawer filing cabinet, one plan rack and one coat rack and shelf.
 - .7 Maintain in clean condition.

1.9 Equipment, Tools 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.

1.10 Sanitary Facilities

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

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

1.11 Construction Signage

- .1 Provide project identification site sign comprising foundation, framing, and one 1200 x 2400 mm signboard as detailed and as described below.
 - .1 Foundations: 15 MPa concrete to CSA-A23.1 minimum 200 mm x 900 mm deep.
 - .2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
 - .3 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
 - .4 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CAN/CGSB 1.189.
 - .5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
 - .6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by PCA Representative.
- .2 Locate project identification sign as directed by PCA Representative and construct as follows:
 - .1 Build concrete foundation, erect framework, and attach signboard to framing.
 - .2 Paint surfaces of signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.
 - .3 Apply vinyl sign face overlay to painted signboard face in accordance with installation instruction supplied.
- .3 Direct requests for approval to erect Consultant/Contractor signboard to PCA Representative. For consideration general appearance of Consultant/Contractor signboard must conform to project identification site sign. Wording in both official languages.
- .4 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.

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

1.12 Protection and Maintenance of Traffic

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by PCA Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by PCA Representative.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work. Snow removal must include the work zone.

- .14 Remove, upon completion of work, haul roads designated by PCA Representative.

1.13 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.
- .4 Stack stored new or salvaged material not in construction facilities.

2. PRODUCTS

2.1 Not used

- .1 Not Used.

3. EXECUTION

3.1 Not used

- .1 Not Used.

1. GENERAL

1.1 Quality

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility of the contractor, but is precaution against oversight or error. Contractor has to remove and replace defective products at his own expense and be responsible for delays and expenses caused by rejection.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with the PCA Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacturer for any particular or like item throughout building.
- .5 Use products which do not pose a risk to the health and safety of people and animals.

1.2 Storage, Handling and Protection of Products

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Remove and replace damaged products at own expense and to satisfaction of the PCA Representative.

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

1.3 Transportation

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

1.4 Manufacturer's Instructions

- .1 Unless otherwise indicated in the specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify the PCA Representative in writing, of conflicts between specifications and manufacturer's instructions, so that PCA Representative is able to establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, the PCA Representative could require removal and re-installation at no increase in Contract Price or Contract Time.

1.5 Quality of Work

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify the PCA Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. The PCA Representative reserves the right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with the PCA Representative, whose decision is final.

1.6 Coordination

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.7 Remedial Work

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.8 Location of fixtures

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform the PCA Representative of conflicting installation. Install as directed.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Not used

- .1 Not used.

1. GENERAL

1.1 Submittals

- .1 Submit to the Representative of PCA copies of the following documents, including updates published:
 - .1 Prior to starting work on the construction site, submit the health and safety program, as indicated in the paragraph 1.9.
 - .2 Immediately after the time of their receipt, the reports and the directives transmitted by the competent authorities.
 - .3 The reports of accidents or incidents, within 24 hours of their occurrence.
- .2 Submit other data, information and documents on request of the PCA Representative, as stipulated elsewhere in this section.

1.2 Compliance Requirements

- .1 Comply with Quebec's latest regulations of occupational health and safety, as well as with the regulations pertaining to it.
- .2 Observe and apply the security measures in construction required by:
 - .1 The National Building Code of Canada (latest version).
 - .2 The Commission of health and safety at work of Quebec (CSST).
 - .3 The regulations and ordinances of the municipalities.
- .3 In case of conflict between the stipulations of above mentioned authorities, apply the most rigorous one.
- .4 Provide and maintain insurance for workers compensation for all employees, for the duration of the contract. Before the start of the work, at the time of provisional execution and before the final payment, give the PCA Representative a letter (a certificate) of occupational health and safety (or the equivalent agency) attesting that the account of the contractor is in good standing.
 - .1 If the contractor is the only owner, give the PCA Representative an acceptable documented evidence of personal protection insurance which satisfies at least the set of requirements of compensation insurance for accidents at workplace.

1.3 Responsibility

- .1 The contractor is responsible for health and safety of persons and property on site and of federal employees and the general public circulating near the work on the worksite where the work being carried out could put people in danger.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applying federal, provincial, territorial and local laws, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 If a risk or an unforeseen danger or incident occurs during the execution of the work, immediate measures must be taken to correct the situation and to prevent all sorts of damage and injury. Inform the Representative of PCA verbally and in writing of the danger or the situation.

1.4 Site and Access Control

- .1 Control the worksite access and the activities which take place therein. Define the site boundary and isolate the adjacent or neighboring areas by the use of appropriate means to maintain control of all the access points of the worksite.
- .2 Take proper measures to allow worksite access to all persons who should have access. The procedures for access authorization must be in accordance with Quebec occupational health and safety, the pertinent regulations thereunder and the health and safety program of the contractor.
- .3 Ensure that the persons authorised to access the site possess and carry minimum personal safety equipment specified in contractor's health and safety program. Ensure that the authorized persons have received the appropriate safety equipment, which are more stringent in character than those of the minimum equipment previously mentioned, and site-specific, they have received the training to use these equipments they carry. Ensure the equipments are effective.
- .4 Install signboards at access points and at other strategic locations around the site clearly indicating that the zone(s) of the site is (are) "prohibited(s)" for non-authorized persons. The signs must be prepared according to the rules of the art and bear the symbols well understood. The panels should not be used for advertising purposes, but to clarify information on site safety and on the main resource persons.

- .1 Information required on signboard:
 - .1 Name and description of the project
 - .2 Name of the contractor
 - .3 Name and phone no. of the superintendent of the project
 - .4 Name and phone no. of the contact-person of PCA.
- .5 Ensure the safety of the site at any time in order to prevent the access of non-authorized persons.

1.5 Filing of Notice

- .1 Prior to commencing work, file the Notice of project and all other advices from provincial or territorial authorities and give a copy to the Representative of PCA.

1.6 Permits

- .1 Obtain all required permits, licenses and compliance certificates stipulated by the competent authorities.
- .2 Make all the permits, licenses and compliance certificates available on-site and submit copies to the PCA Representative.

1.7 Site Condition

- .1 The hazardous substances and conditions at the site must be regarded as dangerous to health and environment, and must be managed in an appropriate manner. Contractors must take into account the dangerous substances and conditions known and must include in price proposal all the work that would be executed in the danger zone or adjacent to it and in the presence of dangerous substances.
- .2 Include the above mentioned articles in the danger evaluation program of this specification.

1.8 Meetings

- .1 Prior to commencing work, attend a scheduled meeting led by the Representative of PCA. Ensure at least of the presence of the contractor's site superintendent. The PCA Representative must specify the time, date and place of the meeting and take care of the drafting and distribution of the minutes.

- .2 Arrange meetings on site-specific health and safety as required by Quebec Occupational health and safety law and the relevant regulations made thereunder.
- .3 Prepare and display at site, the minutes of all meetings. Ensure that the Representative of PCA can get copies on request.

1.9 Health and Safety Program

- .1 Under the Quebec Occupational health and safety law and the other pertinent regulations made thereunder, the contractors must schedule a health and safety program. The compliance requirements related to the content, the details and implementation of the program fall within provincial or territorial regulations. For the purposes of this contract, the health and safety program must include a site-specific health and safety plan, which recognizes, assesses and addresses the hazardous conditions and substances, as well as continuous assessments of dangers arising during the duration of the work and documenting the health risks and dangers for the security, new or potential, unknown and not previously identified.
- .2 Prior to starting work, give the Representative of PCA a copy of the health and safety program. The copy handed to the Representative of PCA must be used to assess the program based on the contract requirements concerning the known hazardous substances and conditions. The review does not imply that the Representative of PCA approves the program as being complete, accurate, and legally consistent with the Quebec act on occupational health and safety and other pertinent regulations, and must not relieve the contractor of his legal obligations under such an act.

1.10 Reporting of Accidents

- .1 Investigate the accidents and occurrences and report them as required by the Quebec law on health and safety at work, as well as other regulations made thereunder.
- .2 For the purpose of this contract, investigate immediately the accidents or the occurrences including the following points and submit a report to the PCA Representative:
 - .1 An injury that may or may not require a medical assistance, but resulting in a loss of work time for the injured person(s).
 - .2 An exposure to toxic chemicals or substances.

- .3 Property Damage.
- .4 An interruption of activities within the infrastructure or adjacent to it, likely to result in losses.
- .3 During the investigation of the incidents and accidents and the reporting of accident, the contractor is obliged to intervene quickly in order to rectify the actions deemed as the causes of the accident or incident and provide a written notice of the measures taken to prevent the incident or accident to happen again.

1.11 On-site Documents

- .1 A copy of security documents prescribed in this section, as well as all other reports and documents related to the security prescribed by the competent authorities must be available.
- .2 The security documents should be available to the PCA Representative any time on request.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Safety Measures and Park Access

- .1 One or more radios will be provided to the Contractor to be able to join the PCA Representative at all times.
- .2 In the case of the loss of one or more radios, the Contractor shall renew his request and he will pay the costs of the loss. At the end of the work, the Contractor must return the radios, without which the final payment may be withheld.
- .3 During the months of October to December 2016, the Agency will take over the management of the park barrier at St-Mathieu area of the park. In the following months, the Contractor will be responsible and if necessary, shall provide, at its expense, a person (guardian) to do the management of the latter. Note: the barrier will remain closed at all times

- .4 One or more keys will be provided, if necessary to access the work site.
- .5 In the case of loss of one or more keys, a claim, non-refundable, of \$ 500.00 per key for lost keys will be demanded from the Contractor.

1. GENERAL

1.1 Project Cleanliness

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site daily at scheduled times or dispose of as directed by PCA 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 Dispose of waste materials and debris off site.
- .5 Store volatile waste in covered metal containers, and remove from premises at the end of each working day.
- .6 Use only the cleaning products recommended by the manufacturer of the surface to be cleaned, and use according to manufacturer's recommendations of the products in question. The cleaning products must be non-toxic for the environment.
- .7 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted.

1.2 Final Cleaning

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by PCA 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 Remove dirt and other disfiguration caused by the work.

1.3 Waste Management and Disposal

- .1 Separate waste materials for reuse and recycling.

2. PRODUCTS

2.1 Not used

- .1 Not used

3. EXECUTION

3.1 Not used

- .1 Not used

1. GENERAL

1.1 References

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-(current edition), Stipulated Price Contract.
- .2 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 Administrative Requirements

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify PCA Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request PCA Representative's inspection.
 - .2 PCA Representative's Inspection:
 - .1 PCA Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English and French that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested and fully operational.
 - .4 Work: complete and ready for final inspection.

.4 Final Inspection:

- .1 When completion tasks are done, request final inspection of Work by PCA Representative, and Contractor.
- .2 When Work incomplete according to PCA Representative, complete outstanding items and request re-inspection.

1.3 Final Cleaning

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Not used

- .1 Not used.

1. GENERAL

1.1 Administrative Requirements

- .1 Scheduled Pre-warranty meeting upon closeout
 - .1 Convene meeting one week prior to completion of work with contractor's representative and the PCA Representative in order to:
 - .1 Verify project requirements.
 - .2 Review warranty requirements and installation instructions.
 - .2 The PCA Representative will establish communication procedures for:
 - .1 Notifying the defects for elements, materials or systems covered by a warranty.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 Submittals for Approval

- .1 Submit the required documents and samples in accordance with section 01 33 00 Documents and samples to submit.
- .2 All documents must be in French.
- .3 On request, provide the documents confirming the type, source of supply and the quality of the products supplied.

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 operational sequence, 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.

1.4 Contents - Project Record Documents

- .1 Table of Contents for Each Volume: provide title of project.
 - .1 Date of submission
 - .2 Names, addresses, and telephone numbers of PCA Representative as well as names of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.5 As-built Document and Samples

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

1.6 Recording Information on Project Record Documents

- .1 Record information on set of opaque drawings, provided by PCA Representative.
- .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 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract.
 - .4 References to related shop drawings and modifications.
- .5 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.
- .6 Other Documents: maintain manufacturer's certifications,[inspection certifications, field test records required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

2. PRODUCTS

2.1 Not used

- .1 Not used.

3. EXECUTION

3.1 Not used

- .1 Not used.

1. GENERAL

1.1 Definitions

.1 Definitions

- .1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
- .2 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.
- .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.2 References

- .1 Canadian Environmental Protection Act (CEPA)
 - .1 CCME PN 1327-2008, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.
- .2 CSA International
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .3 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET)

- .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.
- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 Administrative Requirements

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one (1) week prior to beginning work of this Section, with the PCA Representative focusing on:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work.
 - .2 Hold project meetings to inform PCA Representative about the work progress.
 - .3 Ensure the presence of the key personnel of the project.
 - .4 WMC must provide written report on status of waste diversion activity at each meeting.
- .2 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .1 In event of unforeseen delay notify PCA Representative.

1.4 Action and Informal Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 The CGD will need to ensure compliance of all the requirements related to the transmission of documents, samples and required reports.
- .3 Submit at the end of the work all copies of certified weigh bills, bills of landfill, receipts from authorized disposal sites and reuse and recycling facilities for material removed from site.
 - .1 Written authorization from PCA Representative is required to deviate from waste receiving organizations listed in Waste Reduction Workplan.
- .4 Shop Drawings:
 - .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
 - .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .5 Sustainable Design Submittals:
 - .1 Management of construction waste in compliance with sections 01 35 43 – Environment protection.

1.5 Quality Assurance

- .1 Regulatory Requirements: Ensure Work is performed in compliance with CEPA and Municipal regulations.

1.6 Site Conditions

- .1 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Fires and burning of waste or materials is not permitted on site.

- .4 Do not bury rubbish waste materials.
- .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout project.
- .6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction.
- .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .9 Prevent extraneous materials from contaminating air or aquatic areas beyond application area, by providing temporary enclosures during demolition work.
- .10 Contain or cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.7 Existing Conditions

- .1 If material resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in course of demolition, stop work, take preventative measures, and notify PCA Representative immediately. Proceed only after receipt of written instructions have been received from PCA Representative.
- .2 Structures to be demolished are based on their condition on date that tender is accepted, at time of examination prior to tendering.

2. PRODUCTS

2.1 Equipement

- .1 Equipment and heavy machinery
 - .1 On-road vehicles have to respect CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations, CEPA-SOR/2006-268,

Regulations Amending the On-Road Vehicle and Engine Emission Regulations.

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

3. EXECUTION

3.1 Work preparation

- .1 Protection of in-place conditions:
 - .1 Work in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades, properties, parts of existing building.
 - .1 Provide bracing, shoring and underpinning as required.
 - .2 Repair damage caused by demolition as directed by PCA Representative.
 - .3 Support affected structures and, if the structure being demolished appears to endanger the adjacent structures or services, take preventative measures, stop Work and immediately notify PCA Representative.
- .2 Surface preparation
 - .1 Disconnect and re-route electrical and telephone service lines entering buildings to be demolished.
 - .1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.
 - .2 Disconnect and seal mechanical services.
 - .1 Natural gas supply lines: remove in accordance with gas company requirements.

- .2 Sewer and water lines: remove them within the property line in accordance with authority having jurisdiction.
- .3 Other underground services: remove and dispose them as directed by Representative of PCA.
- .3 Do not disrupt active or energized utilities traversing the premises
- .4 Remove rodent and vermin, if applicable.

3.2 Temporary Shoring

- .1 After the installation of the temporary shoring and its inspection by an engineer member of the Ordre des ingénieurs du Québec, the contractor must submit to the PCA Representative a written notice sign by the engineer indicated that the shoring is installed as plans.
- .2 This notice must contain the date and time of the inspection and must be submitted before the demolition work.

3.3 Demolition

- .1 Execute the demolition work conforming the structural plans and specifications.
- .2 Blasting operations not permitted during demolition.
- .3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
- .4 Execute the demolition work in accordance to section 15.1 of the *Cahier des Charges et Devis Généraux (CCDG)*.
- .5 Remove materials defined as contaminated or dangerous by competent authorities of environmental protection, and remove from work site while taking all necessary measures to reduce dangers to a minimum during their removal and evacuation.
- .6 Remove the existing equipment, services and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .7 At end of each day's work, leave Work in safe and stable condition.

- .8 Demolish to minimize dusting.
- .9 Contain fibrous materials to minimize release of airborne fibres while being transported within facility.

3.4 Cleaning

- .1 Divert excess materials from landfill to site approved
- .2 Designate appropriate security resources / measures to prevent vandalism, damage and theft.
- .3 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.
 - .1 Label stockpiles, indicating material type and quantity.
- .4 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .5 Transport material designated for alternate disposal using approved haulers facilities by receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
- .6 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

1. GENERAL

1.1 Reference

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-/A23.2 (current edition), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86S1 (current edition), Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CSA O121 (current edition), Douglas Fir Plywood.
 - .4 CSA O151 (current edition), Canadian Softwood Plywood.
 - .5 CSA O153 (current edition), Poplar Plywood.
 - .6 CAN/CSA-O325.0 (current edition), Construction Sheathing.
 - .7 CSA O437 Series (current edition), Standards for OSB and Waferboard.
 - .8 CSA S269.1 (current edition), Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3 (current edition), Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701 (current edition), Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET)
 - .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.

1.2 Price and Payment Terms

- .1 No measurement will be made in terms of this section.
- .2 Formwork and accessories costs must be included in the concrete work in accordance with section 03 30 00 – cast- in-place concrete-

1.3 Action and Informational Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and CCDG section 15.4.
- .2 Submit shop drawings for formwork and falsework.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets.
- .4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.
- .5 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .6 Indicate sequence of erection and removal of formwork/falsework as directed by the PCA Representative and the CCDG.

2. PRODUCTS

2.1 Materials

- .1 Materials and resources in accordance with CCDG Section 15.4 and standards mentioned therein.

3. EXECUTION

- .1 Formwork implementation in accordance with CCDG 15.4 and standards mentioned therein.

1. GENERAL

1.1 References

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A82/A82M (current edition), Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A143/A143M (current edition)], Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .3 ASTM A185/A185M (current edition), Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .4 ASTM A775/A775M (current edition), Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International
 - .1 CSA-A23.1/A23.2 (current edition), Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3 (current edition), Design of Concrete Structures.
 - .3 CSA-G30.18 (current edition), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA-G40.20/G40.21 (current edition), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CAN/CSA-G164 (current edition), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .6 CSA W186 (current edition), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)

- .1 RSIC, Reinforcing steel, Manual of Standard Practice
- .5 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET)
 - .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.

1.2 Price and Payment Procedures

- .1 No measurement will be made in terms of this section.
- .2 Reinforcing steel costs must be included in the concrete work in accordance with section 03 30 00 – cast- in-place concrete-

1.3 Action and Informational Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and CCDG section 15.4.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered and qualified. Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 List of reinforcements.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the PCA Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .6 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, otherwise indicated.

1.4 Quality Assurance

- .1 Reinforcing steel quality assurance in accordance with CCDG Section 15.4 and standards mentioned therein.

1.5 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with CCDG Section 15.4 and standards mentioned therein.

2. PRODUCTS

2.1 Materials

- .1 Substitute different size bars only if permitted in writing by the PCA Representative.
- .2 Reinforcing steel: billet steel, grade 400W, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .4 Welded deformed steel wire fabric: to ASTM A82/A82M. Provide in flat sheets only.
- .5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .6 Mechanical splices: subject to approval of the PCA Representative.
- .7 Anchor product (chemical adhesive): in accordance with ASTM E488M "Standard Test Methods for Strength of Anchors in Concrete Elements".
- .8 Plain round bars: to CSA-G40.20/G40.21.

2.2 Fabrication

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and with Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RISC).
- .2 Obtain PCA Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

3. EXECUTION

3.1 Preparation

- .1 Execution of preparatory work and implementation of reinforcing steel and anchors for concrete: in accordance with CCDG Section 15.4 and standards mentioned therein.
- .2 Do not field bend or field weld reinforcement except where indicated or authorized by the PCA Representative. When field bending is authorized, bend without heat, applying slow and steady pressure. Replace bars, which develop cracks or splits.

1. GENERAL

1.1 References

- .1 Abbreviations and Acronyms:
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (b denotes blended).
 - .1 Type GU, GUb and GUL - General use cement.
 - .2 Type MS and MSb - Moderate sulphate-resistant cement.
 - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
 - .4 Type HE, HEb and HEL - High early-strength cement.
 - .5 Type LH, LHb and LHL - Low heat of hydration cement.
 - .6 Type HS and HSb - High sulphate-resistant cement.
 - .2 Fly ash:
 - .1 Type F - with CaO content less than 15%.
 - .2 Type CI - with CaO content ranging from 15 to 20%.
 - .3 Type CH - with CaO greater than 20%.
 - .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM C260/C260M (current edition), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309 (current edition), Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M (current edition), Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M (current edition), Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

- .5 ASTM D412 (current edition), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .6 ASTM D624 (current edition), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .7 ASTM D1751 (current edition), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .8 ASTM D1752 (current edition), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 CSA International
 - .1 CSA A23.1/A23.2 (current edition), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283 (current edition), Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000 (current edition), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET)
 - .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.
 - .2 Normes, Tome VII : Matériaux (current edition)

1.2 Price and Payment Procedures

- .1 Measurement and Payment:
- .2 Measurement Procedures: in accordance with Section 01 29 00 - Payment Procedures.
 - .1 Concrete placed beyond dimensions indicated will not be measured.

- .2 No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
- .3 No deductions will be made for volume of concrete less than 0.1 m² in cross sectional area in volume displaced by individual drainage openings.
- .4 Cast-in-place concrete in superstructure will not be measured but will be paid for as fixed price item.
- .5 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.
- .6 Supply and installation of reinforcing steel and chemical adhesive for concrete will not be measured but considered incidental to work.
- .7 Supply and installation of formworks and accessories for concrete will not be measured but considered incidental to work.
- .8 Supply and installation of shelter, insulation and heating for cold protection will not be measured but considered incidental to work.

1.3 Action and Informational Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and CCDG section 15.4.
- .2 Provide testing and inspection results reports for review by PCA Representative and do not proceed without written approval when deviations from mix design or parameters are found.

1.4 Quality Assurance

- .1 Reinforcing steel quality assurance in accordance with CCDG Section 15.4 and standards mentioned therein.
- .2 Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by PCA Representative on following items:
 - .1 Formwork and falsework erection.
 - .2 Implementation methods.
 - .3 Hot weather concrete.

- .4 Cold weather concrete.
- .5 Curing.
- .6 Finishes.
- .7 Formwork removal.
- .8 Joints.

1.5 Delivery, Storage and Handling

- .1 Deliver, store and handle of concrete in accordance with CCDG Section 15.4 and standards mentioned therein.

2. PRODUCTS

2.1 Materials

- .1 The concrete required as indicated on the plan in accordance with CCDG Section 15.4 and standards mentioned therein.
- .2 The concrete required as indicated on the plan in accordance Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET), Tome VII, Norme 3101.

3. EXECUTION

- .1 Do cast-in-place concrete work in accordance with CCDG Section 15.4 and standards mentioned therein.
- .2 Site tests: conduct tests as follows on concrete in a plastic state:
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Air and concrete temperature.
- .3 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by the PCA Representative for review to CSA A23.1/A23.2 and CCDG.

- .4 The testing laboratory designated by the PCA Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Inspection or testing by the testing laboratory designated by the PCA Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

1. GENERAL

1.1 References

- .1 Abbreviations and Acronyms:
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (b denotes blended).
 - .1 Type GU, GUb and GUL - General use cement.

1.2 Related Requirements

- .1 Section 06 18 00 : Glued Laminated Construction.

1.3 Description

- .1 The work covered by this section include the expertise, labor , materials equipment and services necessary to perform the procurement, fabrication, transportation and installation of structural steel in accordance with plans, specification herein, and the contract documents.
- .2 The work includes all structural steel shown on the structural drawings .
- .3 The Contractor must qualify under the provisions of the CAN / CSA - W47.1 " Certification of Companies for Fusion Welding of Steel ". The Contractor and all its staff assigned to perform welding work will be accredited in Division 1 or 2 with the Canadian Welding Bureau.
- .4 All components of structural steel is hot dip galvanised.

1.4 References

- .1 The following standards and publications mentioned in this section are an integral part and their requirements apply, but with respect to other requirements of this section.
- .2 ASTM International Inc.
 - .1 ASTM A36/A36M (current version), Standard Specification for Carbon Structural Steel.
 - .2 ASTM A193/A193M (current version), Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.
 - .3 ASTM A307 (current version), Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A325 (current version), Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

- .5 ASTM A325M (current version), Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength[Metric].
- .6 ASTM A490M (current version), Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10 (current version), Protective Coatings for Metals.
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 Handbook of the Canadian Institute of Steel Construction.
 - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA G40.20/G40.21 (current version), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164 (current version), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16 (current version), Limit States Design of Steel Structures.
 - .4 CAN/CSA-S136 (current version), North American Specifications for the Design of Cold Formed Steel Structural Members.
 - .5 CSA W47.1 (current version), Certification of Companies for Fusion Welding of Steel.
 - .6 CSA W48 (current version), Filler Metals and Allied Materials for Metal Arc Welding.
 - .7 CSA W55.3 (current version), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .8 CSA W59 (current version), Welded Steel Construction (Metal Arc Welding).
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
 - .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

- .7 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET).
 - .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.

1.5 Action and Informational Submittals

- .1 The Contractor must prepare and forward to the PCA representative within two weeks of receipt of documentation for construction, the schedule shop drawings and fabrication sequence. The schedule should reflect in detail the requirements of the contract schedule and be updated regularly. Schedule revisions must be forwarded to the PCA Representative.
- .2 Assembly sketches
 - .1 At least four (4) weeks prior to shop drawings submission, provide submittals for review and acceptance:
 - .1 Sketches of all proposed standard assemblies.
 - .2 Sketches and design brief of all proposed non-standard, eccentric or field welded assemblies.
 - .2 Submit sketches and design brief are stamped and signed by a qualified professional engineer licensed in the Province of Quebec. The services of the engineer should be retained and paid by the Contractor.
- .3 Shop and erection Drawings:
 - .1 Prior to fabrication, submit to PCA Representative for review and comments shop, erection, assemblies and bearings drawing, describing all the necessary elements to perform work according to plans and specifications. The Contractor shall not undertake the fabrication of structural members until the shop and erection drawings have been reviewed by the PCA Representative .
 - .2 Shop and erection drawings must be submitted early enough. The CPA Representative must have at least fifteen (15) working days to review those drawings.
 - .3 Submit shop and erection drawings are stamped and signed by a qualified professional engineer licensed in the Province of Quebec, and the assemblies' designer. The services of the engineer should be retained and paid by the Contractor.
 - .4 Maintain up to date a register of shop drawings. An electronic copy (.xlsx format) the register should always accompany submittals.

Resubmit the revised register depending on the current status of each drawing again , either

- No correction
- Do correction as indicated
- To resubmit
- Rejected

- .5 Shop and erection drawings must refer to the contract number and the engineering drawings. The full title of the project as well as the name of the engineer, the PCA representative and the Contractor must appear on each drawing.
- .6 Contractor is authorized to use engineering drawings issued for construction, for the achievement of its erection drawings, but the title block must be replaced and the seal of the Consultant withdrawn.
- .7 Revised drawings, with or without annotations, examined by the PCA Representative, will be returned to the Contractor which, if necessary, will revise the drawings and submit them back to the PCA Representative for review and comment. However, if the PCA Representative deems that necessary revisions are too many, he may return the drawings without annotating; In addition, if the drawings must be submitted more than twice, the PCA Representative will make a deduction to the Contractor's billing to cover the additional cost review by the consulting engineer.
- .8 Contractor is responsible for the accuracy of his drawings; he cannot claim extra for delays caused by the discovery of errors or omissions on its own drawings , even if they have been reviewed by the consulting engineer .
- .9 The Contractor must have a quality control program, subject to the approval of the PCA Representative, generally conforms to the ISO-9002 standard. This program must be submitted to the PCA Representative before signing the contract.
- .10 The PCA Representative reserves the right to inspect the work at the factory of the Contractor and those of its suppliers and subcontractors, at any time during opening hours. Cooperation during visits must comply with CAN / CSA-S16.

.4 Welding Procedure

- .1 Before beginning fabrication, submit for the consideration of the PCA Representative the workshop welding procedures. welding procedures on the site must also, where appropriate, be submitted.
- .2 The Contractor shall qualify under the provisions of the CAN/CSA-W47.1 "Certification of welding companies for fusion of steel structures". The Contractor and all his staff assigned to carry out welding work must be accredited in Division 1 or 2 with the Canadian Welding Bureau. At the request of the PCA Representative, certificates must also be submitted for any specialized contractor.
- .5 Assembly Procedure
 - .1 Submit assembly procedure signed and sealed by an engineer member of the Ordre des ingénieurs du Québec and in particular include design criteria, lift points, forces at the lift points, temporary bracing, temporary supports, splices, lifting sequences, lifting equipment, etc.
 - .2 Submit this procedure at least 2 weeks before the start of assembly work.
- .6 Samples
 - .1 Obtain certificates issued by the steel plant and attesting to the chemical composition and physical properties of the steel used before manufacture, and deliver these documents to the PCA representative.
- .7 Test Reports
 - .1 Submit for review to the PCA Representative, the test reports carried out at the plant (mill test report) including among others the physical properties of materials and chemical composition.
 - .2 At the request of the PCA Representative, submit the reports of quality and non-destructive tests at the factory. These reports must list the parts inspected and the tests performed.

1.6 Authorisation/Approval of the PCA Representative

- .1 When required in accordance with the requirements of this section of the specification, the permission or approval of the PCA Representative must not be considered as having been obtained until notification in writing has been received, or recorded in a minutes of meeting ratified by all present at site meeting which the PCA Representative attended.

1.7 Delivery, Storage and Handling

- .1 Load, transport and deliver the steel to the site. Take precautions to avoid damaging the elements, the galvanization and painting of the steel parts during handling and transport.
- .2 Ensure that painted or galvanized surfaces are not stacked side against side, but separated with wooden blocks, styrofoam sheets or other suitable materials
- .3 Use nylon slings to lift materials and, if applicable, use the paddles or cradles
- .4 Fasten firmly with steel chains and dunnage to transport vehicles to prevent horizontal movement. Protect the edges of the metal parts with rubber, jute or wood. Do not load small sections in packages inside large profiles "U" or beams
- .5 Unload in the provided area. Provide materials and labour to perform the unloading without damage and place the pieces on wooden blocks.
- .6 Choose the correct size of the wooden blocks and space them properly to avoid contact of stacked steel with the ground.

2. PRODUCTS

2.1 Design Requirements

- .1 Design and calculate the assemblies according to the forces, bending moments and axial and shear forces as indicated on the plans and in accordance with CSA Standard S16.1 .
- .2 Unless otherwise specified, the assemblies must be at least equivalent to those detailed in Tables 3-37 and 3-38 of the book " Handbook of Steel Construction " published by the Canadian Institute of Steel construction.
- .3 Unless otherwise indicated, the beams assemblies must resist the efforts indicated on the plans.
- .4 End plates or the assembly angles of the beams will have a minimum thickness of at least 8 mm and the welds of at least 6 mm.
- .5 Non-detailed bending assemblies on designs for which the design loads are not given need to develop the full capacity in bending to the smallest frame assembly.
- .6 Unless indicated otherwise, welding contact surfaces of the stiffeners by a continuous weld bead on each side of the plate. Use the minimum bead size to the requirements of CSA W59 depending on the thickness of the stiffener.

- .7 Submit splices for approval. Unless otherwise indicated, design splices to develop 100% of the compression and bending capacity.
- .8 Unless otherwise indicated on the plans, all assemblies done in the workshop must be welded assemblies. If bolted connections are specified, high strength bolts are used. Use a minimum of two bolts per bolted assembly (including those made using concrete anchors).
- .9 Unless otherwise indicated on the plans, all assemblies made on site must be bolted type diametrical pressure except for the braces and rigid connections (able to withstand a moment) which must be friction type using a value of $k_s = 0.33$ and $c_1 = 0.82$ and required cleaning. The Contractor may use higher values only if he can demonstrate to the PCA Representative that the contacting surfaces during assembly meet the requirements for the use of such values.
- .10 Assemblies bracing parts must be designed assuming a braced frame type conventional construction, according to the requirements of Article 27.11 of the CAN / CSA-S16
- .11 Assemblies bracing will be friction type for the loads indicated on the plans or diametrical pressure assemblies for loads calculated according to the requirements of Article 27.11 of the CAN / CSA-S16, using the method which gives the greatest number of bolts; however, the preparation of the contact surfaces will be made for friction-type bolts
- .12 When the load it must transmit is not indicated on the plans, the welds will be calculated so as to mobilize to full capacity the elements that are united.
- .13 Eccentric assemblages or located on one side of the web of beams should not be used unless it is impossible to detail a symmetrical assembly.

2.2 Materials and Equipement

- .1 Rolled or welded profiles, plates and bars: conform to the specifications of CSA-G40.20 and CSA-G40.21. Use of 350W grade steel, with the exception of L-profiles, C-profiles and plates which can be 300W grade.
- .2 Tubular profiles: meet the specifications of CSA-G40.20 and G40.21 CSA or ASTM A500. Use of 350W grade steel, class C, unless otherwise specified on the drawings.
- .3 Built-in plates: steel meets the requirements of CSA G40.21 standard, grade 300W.
- .4 Anchor bolts: conform to the specifications of ASTM A307, unless otherwise indicated on the plans.
- .5 High-strength anchor bolts: conform to the specifications of ASTM A193/A193M, unless otherwise indicated on the plans.

- .6 Bolts, nuts and washers: conform to ASTM A325 standard.
- .7 Welding materials: comply with the specifications for CAN/CSA-W48 standards CAN/CSA-W59 and certified by the Canadian Welding Bureau.
- .8 Shear Studs: comply with CSA W59, Appendix H.
- .9 Galvanized Steel: hot-dipped galvanizing: Apply a layer of zinc of at least 600 g/m² at the locations indicated in the plans, according to the CAN / CSA-G164
- .10 Painting of steel components: The work must be carried out using one of the steel structures for paint systems listed in the approval list "high performance paint systems" on the website of the Ministry of Transport Quebec. The topcoat must be identified in the 17038 color standard FED-STD 595 U.S. "Colors Used in Government Procurement".
- .11 In addition to the requirements specified in Article 15.14.4.3.2 c) CCDG, painting the bolts must be performed with the same paint system as used in the factory, but replacing zinc primer by paint epoxy paint or polyurethane resins with a MTMDET approved paint system. The replacement of paint should be a component of the system used at the factory or be compliant to it.
- .12 Materials related to bearings: comply with section 15.9.1.3 of EGDC.

2.3 Fabrication

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved reviewed shop drawings.
- .2 Bearings fabrication in accordance with CCDG section 15.9.1.3

2.4 Exposed Parts

- .1 All structural elements must meet the criteria of the CISC- AESS 4 guide.

3. EXECUTION

3.1 Application

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

3.2 General

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59. Section 12 "Cyclically Loaded Structures — Design and Construction" is in effect.

- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 Erection

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16.
- .2 Field cutting or altering structural members: to approval of PCA Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.4 Cleaning

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

1. GENERAL

1.1 Related Requirements

- .1 Section 06 10 00 - Carpentry.

1.2 References

- .1 American Wood-Preservers' Association (AWPA)
 - .1 AWPA M2-01, Standard for Inspection of Treated Wood Products.
 - .2 AWPA M4-06, Standard for the Care of Preservative-Treated Wood Products.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA O80 Series-F15, Wood Preservation.
 - .2 CSA O80.20-1.1-M97(R2002), This Standard applies to the fire-retardant treatment of lumber by pressure processes..
 - .3 CSA O80.27-1.1-M97(R2002), This Standard covers the fire-retardant treatment of Douglas Fir, hardwood, softwood, and Poplar plywood by pressure processes.
 - .4 CSA O80.201-M89, This Standard covers hydrocarbon solvents for preparing solutions of preservatives.
 - .5 CSA O322-02, Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.
- .3 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1113-[04], Architectural Coatings.

1.3 Action and Informational Submittals

- .1 Submit Submittal submissions: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality assurance submittals: Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.

- .3 For products treated with preservative by pressure impregnation submit following information certified by authorized signing officer of treatment plant:
 - .1 Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.
 - .2 Moisture content after drying following treatment with water-borne preservative.
 - .3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.

1.4 Quality Assurance

- .1 Plant inspection of products treated with preservative by pressure impregnation will be carried out by designated testing laboratory to AWPA M2, and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.
- .2 Inspection and testing of pressure treated lumber will be carried out by a Testing Laboratory designated by PCA Representative.
- .3 PCA Representative will pay for costs of tests.

2. PRODUCTS

2.1 Materials

- .1 Preservative: to CSA-O80 Series, for clear finish.
 - .1 SCAQMD Rule #1113, Architectural Coatings.
- .2 Preservatives: maximum VOC limit 350g/L.

3. EXECUTION

3.1 Application : Preservative

- .1 Treat wood to CSA O80 Series « Wood Treatment » . considering that the lumber is used according to the class of exposure CE4.1.

3.2 Application : Field Treatment

- .1 Comply with AWPA M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.
- .2 Remove chemical deposits on treated wood to receive applied finish.

1. GENERAL

1.1 Related Requirements

- .1 Section 06 18 00 : Glued Laminated Construction.

1.2 References

- .1 ASTM International
 - .1 ASTM D1761-06, Standard Test Methods for Mechanical Fasteners in Wood.
 - .2 ASTM D5456-11, Standard Specification for Evaluation of Structural Composite Lumber Products.
- .2 CSA International
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .4 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber (Current version).

1.3 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec.
 - .2 Erection drawings in accordance with CSA S16 and CSA O86.
 - .1 Shop drawings for members: indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.
 - .2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.4 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area. Store and protect wood from nicks, scratches, and blemishes.
 - .2 Replace defective or damaged materials with new.

2. PRODUCTS

2.1 Framing Structural and Panel Materials

- .1 Lumber: Eastern Hemlock/Tamarac grade No.1 or better, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.

- .2 Timber : Eastern Hemlock/Tamarac grade No.1/No.2 or better.
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.

2.2 Accessories

- .1 Nails, spikes and staples: to CSA B111.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers, in accordance with ASTM A307 standard. Hot dip galvanized.
- .3 Lag bolts in accordance with AISI/ASME B18.2.1-2010. Hot dip galvanized.
- .4 Wood Preservative:

3. EXECUTION

3.1 Preparation

- .1 Inspect the bridge in the company of the PCE Representative, and verify the location and extent of the items to be removed, disposed of , recovered, recycled, and those which must remain in place.
- .2 Notify the PCA Representative and obtain the required approvals before beginning the demolition work.

3.2 Preparation Work

- .1 Apply preservative on wood components before installing them.
- .2 Apply preservative by immersion or by brush. Coat the surface until saturated and allow to soak for at least three (3) minutes in the case of solid wood pieces.
- .3 Before installing the components, generously apply by brush the preservative on all surfaces exposed to cuts, dressings and piercings performed on site.

3.3 Installation

- .1 Install members true to line, levels and elevations, square and plumb.
- .2 Install spanning members with "crown-edge" up.
- .3 Select exposed framing for appearance. Install materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .4 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .5 Countersink bolts where necessary to provide clearance for other work.
- .6 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

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 Protection

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

1. GENERAL

1.1 Related Requirements

- .1 Section 05 12 23 – Structural Steel
- .2 Section 06 10 00 - Carpentry.

1.2 References

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .2 CSA International
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CAN/CSA O80 Series-08, Wood Preservation.
 - .4 CSA O86 Consolidation-09, Engineering Design in Wood.
 - .5 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).
 - .6 CAN/CSA-O122-06(R2011), Structural Glued-Laminated Timber.
 - .7 CSA O177-06(R2011), Qualification Code for Manufacturer's of Structural Glued-Laminated Timber.
 - .8 CSA S16-09, Design of Steel Structures.
 - .9 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .10 CAN/CSA-Z809-08, Sustainable Forest Management.
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

1.3 Design of Glue Laminated Construction

- .1 Details for glue laminated members must be designed as per CAN/CSA S16.1 and CAN/CSA086 to resist shear forces indicated on drawings.
- .2 Details to connect glue laminated members to steel members must be designed and realized by the Contractor via his laminated wood subcontractor.

- .3 The steel manufacturer and wood manufacturer must coordinate their work. The Contractor is responsible for defining and managing work coordination.

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 glued-laminated construction and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit copies of WHMIS MSDS.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
 - .2 Submit erection drawings in accordance with CSA S16 and CSA O86.
 - .3 Shop drawings for members: indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.
- .4 Test and Evaluation Reports: submit certified test reports from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
- .6 Sustainable Design Submittals:
 - .1 Wood Certification: submit [vendor's] [manufacturer's] Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

1.5 Quality Assurance

- .1 Qualifications of labour:
 - .1 Manufacture structural glued-laminated members in plant certified by CSA as meeting requirements of CSA O177.
 - .2 Submit certificate in accordance with CSA O177, Appendix B at completion of fabrication. Fabricator for welded steel connections to be certified to CSA W47.1.

- .3 Place authorization labels on glued-laminated members indicating manufactured in CSA certified plant.
- .4 Certification of material protective sealer.

1.6 Delivery, Storage and Handling

- .1 Deliver, store and handle materials correctly.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .2 Apply protective sealer to glued-laminated units before shipping unless specified otherwise.
 - .3 Wrap members prior to leaving plant with a moisture resistant wrapping.
 - .4 Use padded, non-marring slings for handling glued-laminated members.
 - .5 Protect corners with wood or plastic blocking.
 - .6 Make adequate provision for delivery and handling stresses.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Slit underside of membrane covering during storage at site without defacing member.
 - .3 Store glued-laminated units and protect from weather, block off ground and separate with stripping, so air may circulate around faces of members.
 - .4 Cover glued-laminated units with opaque moisture resistant membrane if stored outside.
 - .5 Store and protect glue-laminated products from nicks, scratches, and blemishes.
 - .6 Replace defective or damaged materials with new.

2. PRODUCTS

2.1 Materials

- .1 Laminating stock: SPF or Douglas Fir
 - .1 FSC certified.

.2 Capacity : Beams and Columns

Force Classification	Nordiclam	Gulam
	Beams 24F-Es	20f-Ex / 12c-E
Bending strength (F_b)	30.7 MPa	25.6 MPa
Longitudinal shear strength (F_v)	2.5 MPa	1.75 MPa
Compression strength perpendicular to grain (F_{cp})	7.5 MPa	5.8 MPa
Modulus of elasticity (E)	13 100 MPa	10 300 MPa
Compression strength parallel to grain (F_c)	33.0 MPa	25.2 MPa
Tensile strength parallel to grain (F_t)	20.4 MPa	17 MPa

.2 Adhesive: to CSA O112.10, to grade of service required in accordance with CAN/CSA-O122.

.1 Urea-formaldehyde free.

.3 Sealer for glued-laminated members: penetrating type, clear, non-yellowing liquid.

.1 Coatings: VOC limit to LEED requirements.

.4 Fastenings:

.1 Split ring connections: hot rolled carbon steel, SAE 1010, in accordance with SAE handbook.

.2 Shear plate connections: Pressed steel type: hot rolled carbon steel, SAE 1010, in accordance with SAE handbook.

.1 Malleable iron type: to ASTM A47/A47M, grade 300.

.3 Lag screws: to ASTM A36.

.4 Bolts: to ASTM A307.

.5 Side plates: to CSA G40.20/G40.21.

.6 Drift pins: to ASTM A307.

.7 Glued-laminated rivets: hot dip galvanized to CSA G40.20/G40.21

.8 Nails and spikes: to CSA B111.

.9 Truss plates: light gauge galvanized sheet steel to ASTM A653, grade A, yield point 255 MPa.

- .5 Galvanizing: to ASTM A123/A123M, hot dipped, minimum zinc coating of 610]g/m².
- .6 Preservative: 2 coats of Sansin SDF ht and a coat of transparent finish.
- .7 Colour Tint: Clear natural pine.

2.2 Fabrication

- .1 Fabricate members to following classifications:
 - .1 Service grade: exterior.
 - .2 Appearance grade: quality.
- .2 Mark laminated members for identification during erection. Marks not to be visible in final assembly.
- .3 Do not apply sealer to areas which are to receive stained finish or preservative treatment.
- .4 Design connections to CSA O86, and CSA S16 unless specifically detailed, to resist shears, moments and forces indicated.
 - .1 Fabricate in accordance with CSA S16.
- .5 Galvanize connections after fabrication.

3. EXECUTION

3.1 Examination

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

3.2 Preservative Treatment

- .1 Pressure treat all members with preservative in accordance with manufacturer's requirements after fabrication, including the ends of beams.

3.3 Erection

- .1 Protect protective sealer from damage before erection.
 - .1 Touch up damaged areas on site with specified sealer.
- .2 Erect glued-laminated members in accordance with approved erection drawings.
- .3 Brace and anchor members until permanently secured by structure. Make adequate provisions for erection stresses.
- .4 Splice and join only at locations as indicated on approved erection drawings.
- .5 Do not field cut or alter members without PCA Representative's prior approval. If approved, preservative treat cut ends.

3.4 Field Quality Control

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, protecting and cleaning of product.
 - .2 Submit 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 Ensure manufacturer's representative is present before and during critical periods of installation.
 - .4 Schedule site visits:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Upon completion of the Work, after cleaning is carried out.

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 and recycling in accordance with Section 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 Protection

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

1. GENERAL

1.1 Scope of Work

- .4 The work includes the provision of expertise, materials, labour, equipment and all that is required for the full and satisfactory completion of all excavation and backfilling work including all related and necessary work for the full execution of works as required on the plans. Work also includes the removal of materials, loading, transportation and disposal to an approved site, if required.
- .5 Also refer to other specification sections for the exact scope of the works.

1.2 References

- .1 Ministère du Développement durable, de l'Environnement et des Parcs
 - .1 Lois et règlements du ministère
- .2 Bureau de normalisation du Québec
 - .1 CAN/BNQ-1809-300/2004 : Travaux de construction – Clauses techniques générales – conduites d'eau potable et d'égout.
 - .2 CAN/BNQ-2501-255-M86 : Détermination de la relation teneur en eau masse volumique - Essai Proctor modifié.
- .3 Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET).
 - .1 Cahier des Charges et Devis Généraux (CCDG) – Infrastructures routières – Construction et réparation Infrastructures routières – Construction et réparation, Édition 2016.
 - .2 Normes, Tome VII : Matériaux (version la plus récente)
- .4 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 D422-63[2002], 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 (12,400 ft-lbf/ft³) (600 kN-m/m³).
- .5 ASTM D1557-[02e1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
- .6 ASTM D4318-[05], Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .5 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
- .6 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.

1.3 Nature of the Soil

- .1 A soil study was carried out on the work site. The study report is attached to these tender documents for information.
- .2 The information on the nature and depth of the soil layer as well as the level of the water table must be considered accurate only at points and when the surveys were conducted.
- .3 It is not guaranteed, moreover, that the information is complete or representative of reality as a whole.
- .4 The Contractor shall engage or hire his own experts to interpret these reports and to assess the difficulties in apprehending and construction methods to implement.

- .5 The Contractor shall take full responsibility for any use or interpretation that can be made of the soil study. No claims will be accepted on the basis of these reports.

1.4 Scope of Excavation Work

- .1 In this section of the specification, excavation means extraction using mechanical or hand tools, or blasting of soil or rock, including snow or ice, covering completely or partially the site where the works are located, as well as debris that may be buried in the ground.
- .2 The excavation work of this company involves excavating soil, by any means whatsoever, for the construction shown in the plans. These include, without being limited to, the following:
 - .1 All snow removal when required;
 - .2 Excavation and backfilling for building the foundations of the bridge;
 - .3 Excavation and backfilling for temporary site access;
 - .4 Profiling slopes from the lake shore, as shown on the plan;
 - .5 All work for temporarily retaining excavation walls;
 - .6 Management of excavated materials management for reuse on the site;
 - .7 Management of contaminated materials;
 - .8 Erosion and contaminants control during construction;
 - .9 Disposition of surplus and waste in accordance with laws and regulations;
 - .10 Cleaning and refurbishment of the premises;
 - .11 Any other work requested in the tender documents required for completion of this work.
- .3 The use of explosives as a technique of excavation is prohibited.
- .4 As required by the nature of the work, carry all surveys, analyses and additional studies required to know, if applicable: the soil to be excavated,

the methods required to maintain safe and stable slopes of excavations, pumping type to use for the drainage of excavations, the method and the difficulties to be encountered in ensuring control of the water table, the properties of the soil in place and the challenges and working methods required for compacting.

1.5 Scope of Backfilling

- .1 The backfilling work includes, but is not limited to, the following :
 - .1 Backfilling under footings, beds, rafts and slabs as indicated in the plans;
 - .2 Backfilling both sides of foundation walls when applicable,
 - .3 Backfilling to foreseen level of finished ground and leveling of surfaces, all as specified in the plans;
 - .4 Backfilling of all necessary temporary structures for the work, such as access to the foreseen level of the finished ground and leveling of surfaces, all as specified in the plans;
 - .5 Compaction of all fill materials;
 - .6 The supply and installation of foundation drains if any;
 - .7 The supply and installation of rip rap for slope protection;
 - .8 Supply and installation of geotextile where required if any
 - .9 Leveling and maintaining surfaces;
 - .10 Repair all damaged structures.
- .2 Do not backfill the foundations of the bridge before the concrete of the bridge reaches 70% of their resistance specified at 28 days.

1.6 Definitions

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock : Original Ignatius, sedimentary or metamorphic rock which, before being excavated was part of solid rock, and stones or fragments of rock having a volume individual superior to 1 m³.Solid

material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 m³ 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, including dense moraines (tills), layers of materials or and frozen materials.
- .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 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-8.1.

.2 Table:

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

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

- .7 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.
- .8 The density of placed backfill material is measured with respect to MDD established by Modified Proctor performed in accordance with ASTM D1557-78 or standard NQ 2501-255.

1.7 Lines and Benchmarks

- .1 Place on the work site all bench marks necessary to delineate exactly in plan and elevation excavations to dig and embankments to be built.
- .2 Contractor shall establish, at his expense, profiles and alignments necessary for carrying out the work from the landmarks shown on the plans or indicated by the Engineer. The Contractor is responsible for the implementation of the works. If the information on the engineering plans are inadequate to locate the works, inquire which benchmarks should be used.

1.8 Protection of Existing Works

- .1 Conduct, with PCA Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, 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 PCA Representative.
- .3 Where required for excavation, cut roots or branches as directed by PCA Representative.

- .4 If it appears that the work can be a danger to existing buildings or to adjacent structures such as the wood retaining wall bordering the lake, stop the work and notify the PCA Representative. Solidly support the structures and resume work only after obtaining permission from the PCA Representative.
- .5 Assume responsibility for the damage that this work may cause due to weather, neglect, lack of coordination or care.
- .6 Refer also to other requirements of the general notes on the plans and conform in all respects.

1.9 Samples

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures, and prescriptions in this section of the technical specification.
- .2 Inform PCA Representative and the laboratory at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
- .3 Submit 70kg samples of type of fill specified [
- .4 Ship samples prepaid to laboratory, in tightly closed containers to prevent contamination and exposure to elements.

1.10 Shoring, Temporary Support, Bracing and Underpinning

- .1 Protect and maintain intact, prevent the movement or settling of structures, buildings, land, paved areas, landscaping of the immediate surroundings. Install necessary shoring, and bracing.
- .2 If required, support or brace excavations, set up sheet piling, build temporary retaining walls and inject concrete to prevent landslides, according to the Occupational Health and Safety Act, and provincial and municipal regulations in force. Remove shoring when no longer required.
- .3 The Contractor shall bear the costs inherent in the construction and maintenance of excavation slopes as required for stability.
- .4 Repair and pay for any damages, and assume responsibility for any accident caused by poorly executed shoring, bracing or underpinning.
- .5 Retain the services of a competent professional engineer to design and inspection of cofferdams and shoring works, bracing and underpinning

work required for the work. The Contractor's engineer shall submit to the site supervisor a written confirmation of compliance of the built shoring works, bracing and cofferdams.

- .6 At least 2 weeks before the start of work, submit for verification design and related technical data documents.
- .7 The design documentation and related technical data submitted must bear the seal and signature of a competent professional engineer.
- .8 The engineer responsible for the design of temporary structures must provide proof that he holds an insurance policy for professional liability, unless he is employed by the Contractor. In such a case, the Contractor shall provide proof that the work of the engineer is covered by his insurance policy.

1.11 Dewatering of Excavations

- .1 The Contractor shall provide a method of drying or dewatering of excavations in accordance with section 01 35 43 Environmental Procedures, in this specification. Work is carried out under dry conditions and use of a cofferdam is required for the work to the central pile.
- .2 Contractor must take into account in setting the price that the work site is located near Lake Wapizagonke and the level of the water table may be influenced by the level of the lake.
- .3 At least two (2) weeks before the start of work, submit for verification the principal schematic, design documents and related technical data documents.
- .4 The Contractor shall bear the costs inherent in the design and construction of the dewatering system of the excavations.

1.12 Access Road and Maintenance of Public Roads

- .1 Keep the surrounding public roads clean and relatively free of soil deposits caused by the transportation of materials. The trucks must be loaded with care to prevent the discharge of materials by the vibrations caused by transportation or by wind. Temporary access roads at the site must be kept clean and accessible during the entire construction period.
- .2 Provide necessary cleaning of the surrounding public roads to the satisfaction of the PCA representative when there is a great amount of soil deposits caused by the transportation of materials.

1.13 Supervision of Work

- .1 The supervision of all excavation and backfilling work will be entrusted to a specialized laboratory in geotechnical engineering. This laboratory services will be retained and paid by the owner.
- .2 The laboratory is the representative of the PCA Representative on the construction site and, as such, is authorized to issue directives to which the Contractor is required to comply.
- .3 Cooperate at all times with laboratory staff and make available the necessary equipment so that they can properly carry out their work

1.14 Payment

- .1 All works of this section are paid at a global overall price as per the items on the materials list provided for this purpose. The price includes materials, equipment, fittings and the labour for the implementation, verification and any incidental expenses. It must cover the losses and damages resulting from the nature of the work, the fluctuation of prices and wages, business risk, strikes, restrictions on transportation, accidents and actions of the elements of nature.
- .2 The price also includes the removal of materials, loading, transportation and disposal at an approved site, if required
- .3 The price also includes everything that is described in the work spans described in this section except for the works to be included in another section of this specification or other item on the materials list.

2. PRODUITS

2.1 Materials

- .1 Typical materials required for earthmoving, excavation and backfilling are indicated on the plans and must conform to the standards mentioned in the CCDG.
- .2 Typical materials required for earthmoving, excavation and backfilling indicated on the plans must conform to the requirements of the Ministère des Transports, Mobilité durable et Électrification des transports (MTMDET), Tome VII.

3. EXECUTION

3.1 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.

3.2 Cleaning, Clearing, Stump Removal and Grubbing

- .1 Proceed with clearing (without using chipping equipment), stump removal and grubbing of the site before excavation. Protect trees located outside of cleared areas indicated on the plans. Manual tree clearing is required.
- .2 Keep the trees that do not hinder the work and protect the roots so that they are not moved or damaged.
- .3 Cut diseased branches and cut down dangerous trees that overhang the excavations.
- .4 Immediately collect any tree, branch or waste that may fall into the aquatic or shore area of the work.
- .5 Unless otherwise indicated, the cut wood becomes the property of the Contractor, who shall dispose of according to regulations.

3.3 Stripping of Topsoil

- .1 Excavate the topsoil
- .2 Strip topsoil to depths as directed by PCA Representative or laboratory. Do not mix topsoil with subsoil.
- .3 Stockpile in locations reserved on site. Stockpile height not to exceed 2 m. Lay a canvas tarp below and over the stockpile of topsoil to prevent contamination.

3.4 Stockpiling

- .1 Stockpile fill materials in piles and accumulate the granular materials in a way that prevents any segregation..
- .2 Protect fill materials from contamination.

- .3 The excavated materials which can be reused in this projet will be conserved on site. The excess materials must be evacuated off-site.
- .4 The contractor may use trail surfaces on the west side of the river to set aside the excavated material produced by the foundation reconstruction work on the west shore.
- .5 Implement sufficient erosion and sediment control during stockpiling.

3.5 Dewatering of Excavations

- .1 Keep excavations free of water while Work is in progress.
- .2 If necessary, remove snow from work area and transport the snow off-site
- .3 Provide for PCA Representative the details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .4 Avoid excavation below groundwater table if quick conditions or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, or other means.
- .5 Protect open excavations against flooding and damage due to surface run-off.

3.6 Installing Cofferdams, Shoring, Bracing and Underpinning

- .1 Construct temporary Works to depths, heights approved by PCA Representative.
- .2 During backfill operation:
 - .1 Unless otherwise indicated or directed by PCA 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 500mm above toe of sheeting.
- .3 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .4 Upon completion of substructure construction:

- .1 Remove cofferdams, shoring and bracing.
- .2 Remove excess materials from site and restore watercourses [as indicated] [as directed] by [Departmental Representative] [DCC Representative] [Consultant].

3.7 Excavation

- .1 It is understood that no special compensation will be paid to the Contractor for digging in quicksand, on hard ground ("hard Plan"), in thin layers of silt or strata of conglomerates with pebbles clay, in broken or solid shale, in cemented gravel or any other material that may be encountered, such as for the extraction of boulders, frozen ground, etc.
- .2 It is understood that no special compensation will be paid to the Contractor for snow removal when required.
- .3 Perform excavation according to the routing, levels and dimensions indicated.
- .4 Provide the equipment, material, labor and materials required for any excavation necessary to build the elements requested in the plans and specifications.
- .5 Dig along the lines and to the precise levels to minimize the required amount of fill. Meet the requirements of the standard NQ 1809-300 and those of the CNESST for the slopes of all excavations.
- .6 The excavation work should not in any way change the bearing capacity of adjacent foundations. Ensure the foundations of existing structures remain undisturbed.
- .7 Limit the work done with construction equipment close to non-backfilled trenches.
- .8 Transport unclean cut or surplus from the site. In the case of dry materials (paving, concrete, pipes, stumps, trees, shrubs, etc.) comply with the instructions of the Règlement sur les déchets solides (Q-2, r. 14) and other municipal or local regulations which may apply.
- .9 Do not obstruct the flow of runoff or natural watercourses. Ensure the control and evacuation of rainwater, water from snowmelt, groundwater and water from any other source on the site to allow the execution of works.

- .10 The bottom of the excavation must be level and consisting of undisturbed soil, free of loose or soft substances and organic matter, snow or ice.
- .11 Protect against frost continuously, the bottom of excavations and stored materials on the site.
- .12 If the soil at the bottom of the excavations seems inappropriate, notify the PCA Representative and proceed according to his instructions.
- .13 Upon completion of excavations, have them approved by the PCA representative.
- .14 Remove any unsuitable material from the bottom of the excavations, the extent and depth determined by the PCA representative.
- .15 When the materials of the bottom of the excavations have been reworked, compact the bottom of the excavation to a density at least equal to that of undisturbed soil.
- .16 Take precautions to remove dust produced.
- .17 Continuously protect excavations during and after the execution of works. Use all materials and equipment required for this purpose.

3.8 Backfilling

- .1 Placing and compaction of backfill must be done to CCDG requirements.
- .2 Under the bases of the ground-seated abutments and piles, place a MG-20 granular materials cushion with a minimum thickness of 150 mm.
- .3 Under the bases of the rock-seated abutments and piles, put in place a concrete pad type V (according to the MTMDET standard 3101)
- .4 Do not proceed with backfilling operations until completion of following:
 - .1 PCA Representative as well as the geotechnician or his representative has inspected and approved installations.
 - .2 Removal of concrete formwork.
 - .3 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

- .5 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .6 Do not use backfill material which is frozen or contains ice, snow or debris.
- .7 Place backfill material in uniform layers not exceeding 300 mm compacted thickness. Compact each layer before placing succeeding layer.
- .8 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.5 m.
- .9 Appropriate transitions should be made where required to ensure adequate behavior of structures.

3.9 Restoration

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section trim slopes, and correct defects as directed by PCA Representative.
- .2 Replace topsoil.
- .3 Reinstate the surface levels disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstate areas affected by Work as directed by PCA Representative.
- .5 Reinstate the surfaces of roads or paths effected by the work to the stat and levels they were at prior to the start of work, including the paving of de paths, taking care to respect the original thicknes of these works.
- .6 If for climatic reasons, the paths affected by the work to be paved cannot be paved before the reopening of trails by PCA, the Contractor must temporarily resurface with wooden decking. The contractor will subsequently pave the trails when the availability of the paving will allow, no later than June 30, 2017.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

3.10 Inspection and Testing

- .1 Testing of materials and soil compaction will be performed by the laboratory designated by the project owner. The frequency of testing is determined by the PCA representative.
- .2 The Employer will bear the cost of inspection and tests conducted on site.
- .3 When testing or inspection of the testing laboratory reveal nonconformity of work or materials to contract requirements, the Contractor shall bear the cost of further testing that may require the PCA representative to verify the acceptability of corrections. It will be the same for the tests required to control the materials in place.

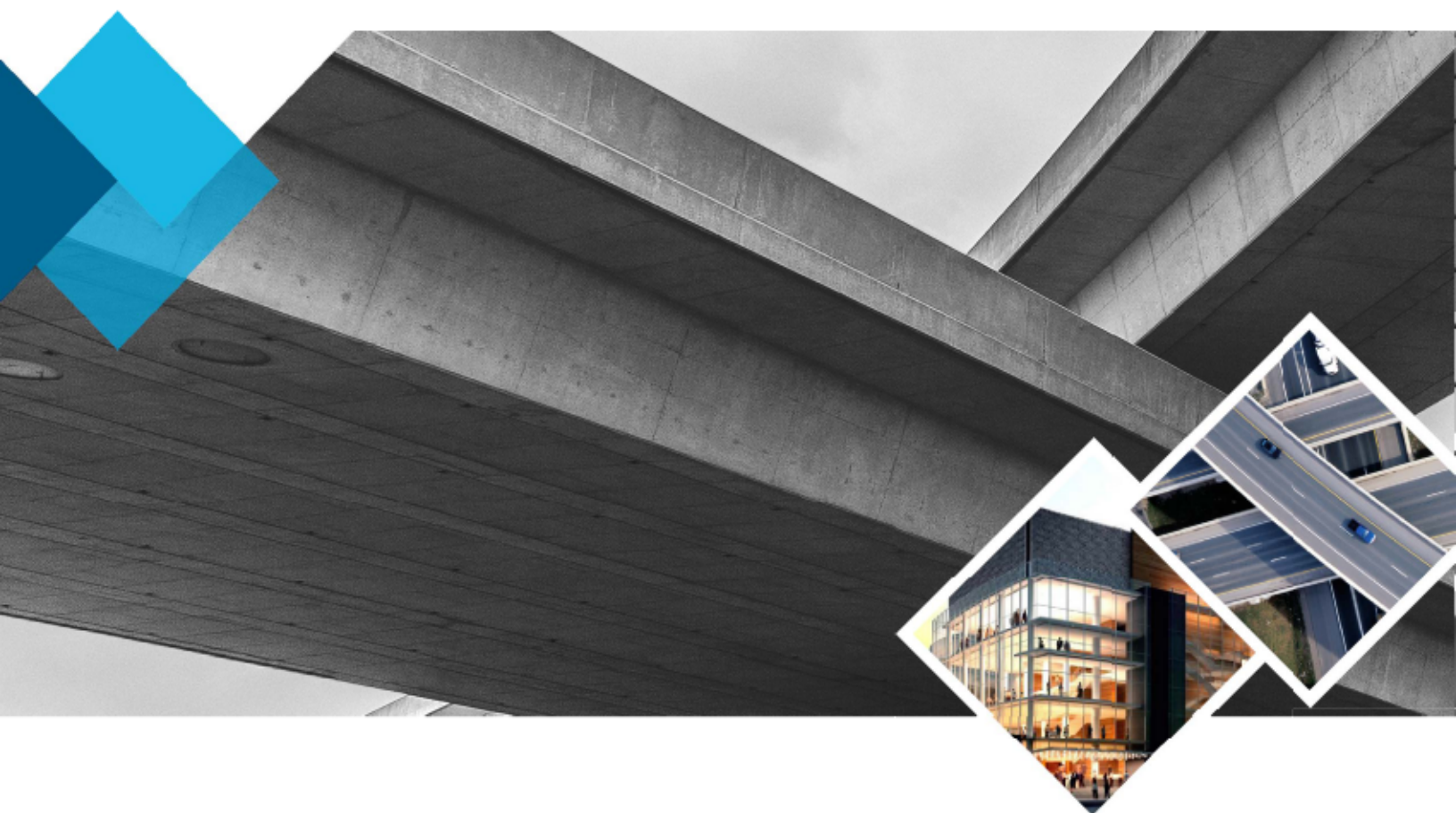


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Reconstruction de la passerelle no 2 Sentier des Cascades Parc national de la Mauricie Saint-Mathieu-du-Parc (Québec)

Étude géotechnique

Agence Parcs Canada



Environnement et géosciences

24 | 08 | 2016

Rapport
Ref. Interne 637126, RG-01



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Étude géotechnique

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N/Document n° : RG-01

Août 2016

Distribution : M. Marc-Olivier Caron – Agence Parcs Canada (PDF)
M. André Caron, ing. – SNC-Lavalin (PDF)

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Annexe 1

Portée du rapport

Annexe 2

Notes explicatives et rapports de forage
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Annexe 3

Résultats des essais en laboratoire, figure 3.1

Annexe 4

Localisation des sondages, 637126-1

Ce rapport est composé de 35 pages incluant les annexes et ne peut être reproduit en tout ou en partie sans l'autorisation de SNC-Lavalin GEM Québec inc.

1 Introduction

Les services professionnels de SNC-Lavalin Environnement et géosciences (« SNC-Lavalin »), antérieurement appelée Qualitas et opérant maintenant sous l'entité légale SNC-Lavalin GEM Québec inc., ont été retenus par l'Agence Parcs Canada pour effectuer une étude géotechnique dans le cadre d'un projet de reconstruction de la passerelle numéro 2, située à l'entrée du sentier des Cascades dans le Parc national de la Mauricie, secteur Saint-Mathieu-du-Parc (Québec).

L'étude géotechnique avait pour objectifs de déterminer la nature et les propriétés des matériaux en place et les conditions de l'eau souterraine.

Le présent rapport comprend une description de la méthode de travail utilisée lors de la reconnaissance géotechnique ainsi que la présentation des résultats des essais effectués sur le terrain et en laboratoire. Il contient également des commentaires et recommandations d'ordre géotechnique relatifs aux travaux prévus.

Ce rapport a été préparé spécifiquement et seulement pour Agence Parcs Canada et les consultants collaborateurs éventuellement au projet. Les conclusions et recommandations qui y sont formulées ne sont valides que pour les conditions et les hypothèses décrites dans le rapport. SNC-Lavalin devra être avisée par écrit de tout changement dans la localisation, la nature ou la conception du projet afin d'en évaluer l'impact et, au besoin, de modifier par document écrit les conclusions et recommandations formulées dans le présent rapport. Précisons enfin que l'aspect environnemental du site ne fait pas partie du présent mandat.

La portée du rapport est décrite en détail à l'annexe 1.

2 Description du site

Le site à l'étude est localisé dans le Parc national de la Mauricie et correspond à la passerelle (no 2) du sentier des Cascades, comme montré sur la figure 1. La passerelle traverse le lac Wapizagonke. Au droit des 2 rives, un talus d'une hauteur d'environ 6 m est présent et est couvert d'arbres et d'arbustes. La figure 2 et la figure 3 montrent une vue générale de la passerelle. L'écoulement de l'eau dans le lac est en direction sud.

Figure 1 : Localisation générale du site à l'étude (Google Maps, le 25 mai 2016).

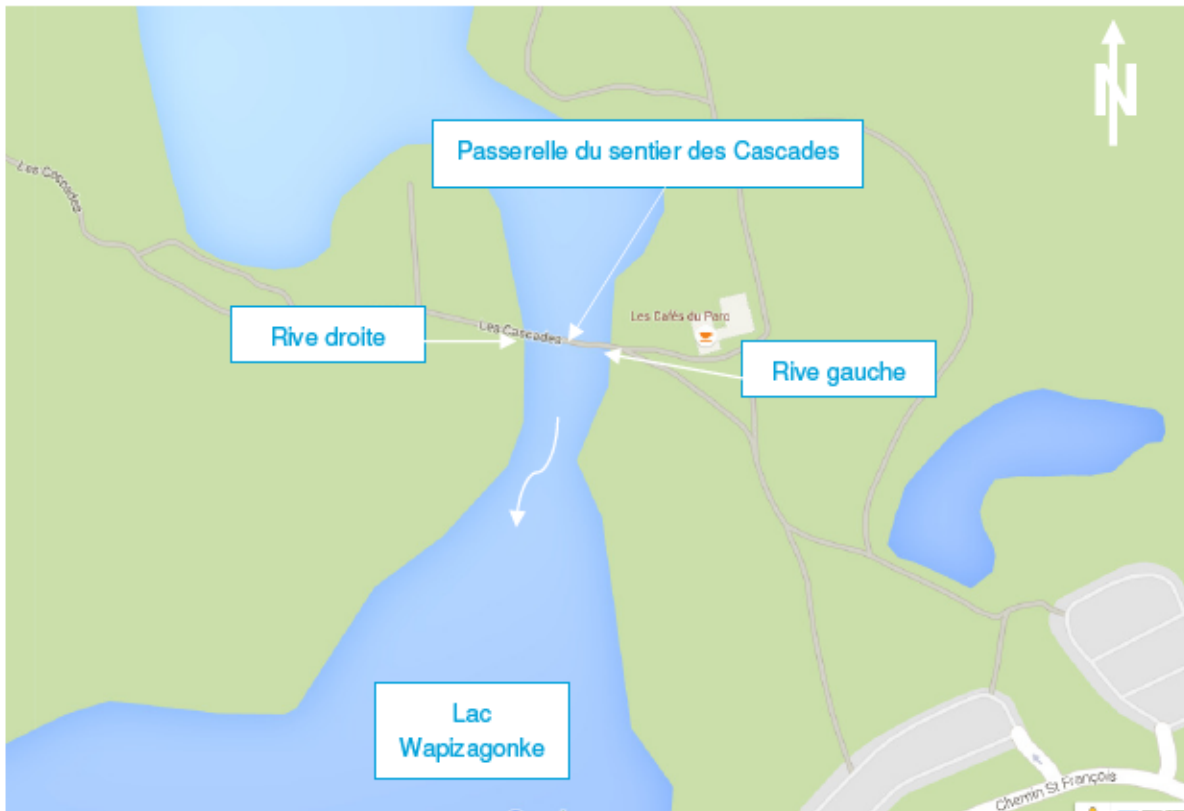


Figure 2 : Vue de l'extrémité de la passerelle en rive gauche.



Figure 3 : Vue de la passerelle en direction de la rive droite.



Au moment des travaux, un couvert de neige était présent sur le site, à l'exception de zones ponctuelles situées sous la passerelle. À ce sujet, une surface dégagée présentant un faciès rocheux a été observée sous la passerelle, en rive droite. En raison des difficultés d'accès, aucun forage n'a pu être effectué pour confirmer s'il s'agissait de roc ou d'un bloc. La figure 4 montre la surface rocheuse observée.

Figure 4 : Surface dure observée, sous la passerelle, en rive droite.



3 Méthode de reconnaissance

3.1 Travaux de terrain

Les travaux d'investigation sur le terrain ont été effectués du 13 au 15 avril 2016. Ceux-ci ont consisté en l'exécution de 4 forages échantillonnés et de 2 essais de pénétration dynamique. Ces travaux ont été effectués sous la surveillance d'un technicien spécialisé en géotechnique de SNC-Lavalin.

Les rapports de forage sont joints à l'annexe 2 du présent document.

3.1.1 Travaux de forage

Le forage F-1 a été exécuté à l'aide d'une foreuse hydraulique de marque UM, modèle 2013, montée sur chenilles et équipée d'un marteau automatique. Les forages F-2 et F-3 ainsi que le sondage F-4 ont été exécutés à l'aide d'un marteau mécanique monté sur un trépied portatif. L'équipement de forage était fourni en sous-traitance par Forage Comeau inc.

L'avancement du forage F-1 a été effectué par la rotation simultanée d'un tubage de calibre NW et d'un trépan à molettes. Les forages F-2 à F-4 ont été avancés par percussion et lavage. Entre les descentes des sections de tubages, des échantillons de sols ont été prélevés au moyen d'un carottier fendu normalisé de 51 mm de diamètre extérieur et de 610 mm de longueur, conformément aux exigences de la norme ASTM D 1586, décrivant l'essai de pénétration standard (SPT). Cet essai permet de déterminer l'indice de pénétration « N », qui indique l'état de compacité des sols pulvérulents.

Un essai de pénétration dynamique au cône (DCPT) a été effectué à partir du fond du forage F-1, soit de 15,85 m à 24,38 m de profondeur, et au droit du forage F-4 à partir de 1,37 m de profondeur. L'essai de pénétration dynamique consiste en l'enfoncement en continu d'un train de tiges de calibre « B », muni à son extrémité d'une pointe conique de 60 degrés d'angle au sommet et de 51 mm de diamètre à la base. L'indice de pénétration dynamique « N_{dc} » est mesuré pour chaque 300 mm d'enfoncement, conformément aux exigences de la norme NQ 2501-145. Les résultats obtenus ont été intégrés aux rapports de forage de l'annexe 2.

Les forages F-2 et F-3 ont été échantillonnés jusqu'à des profondeurs respectives de 7,32 m et 7,47 m alors que le forage F-4 a été échantillonné jusqu'à la profondeur de 1,37 m et poursuivi avec l'essai DCPT jusqu'à la profondeur de 7,62 m.

3.1.2 Instrumentation et colmatage

Des tubes en plastique rigide, perforés à leur extrémité inférieure sur une longueur de 3 m, ont été insérés dans les trous des forages afin de permettre de mesurer le niveau de l'eau souterraine. Les trous des forages ont ensuite été colmatés à l'aide de sable de silice gradué ou de matériau tout-venant jusqu'au sommet de la cavité, où un bouchon de surface a été confectionné à l'aide de bentonite.

3.1.3 Arpentage

L'implantation des forages a été effectuée par le personnel de SNC-Lavalin. Les coordonnées MTM des forages sont indiquées sur les rapports individuels de forage de l'annexe 2. Ces dernières ont été déterminées à l'aide d'un GPS de marque Sx BLUE II modèle 400, ayant une précision horizontale d'environ 1 m.

Le niveau du terrain au droit des forages a été relevé en référence à une grille arbitraire rattachée au-dessus de la dalle de béton du nouveau restaurant, auquel le niveau arbitraire de 100,00 m a été attribué.

Le dessin no 637126-1, joint à l'annexe 4, montre l'emplacement des forages et du repère de nivellement utilisé.

3.2 Travaux de laboratoire

Tous les échantillons de sols et de roc recueillis lors des travaux de forage ont été transportés au laboratoire de géotechnique de SNC-Lavalin à des fins d'examen visuel, d'analyses et de classification. Des échantillons jugés représentatifs des sols en place ont été soumis aux essais en laboratoire indiqués au tableau 1.

Tableau 1 Essais en laboratoire

Essai	Nombre
Teneur en eau naturelle	3
Analyse granulométrique	6

Les résultats des analyses granulométriques sont présentés à la figure 3.1 de l'annexe 3.

Tous les échantillons récupérés lors des travaux de forage et n'ayant pas été utilisés pour les essais en laboratoire seront conservés pour une période de 6 mois suivant la date de transmission de ce rapport. Par la suite, ils seront éliminés à moins d'un avis contraire de la part d'Agence Parcs Canada.

4 Nature et propriétés des sols

La description détaillée des sols rencontrés dans les forages F-1 à F-4 est présentée sur les rapports individuels de forage à l'annexe 2. Un sommaire de la stratigraphie rencontrée dans les forages est présenté au tableau 2.

Tableau 2 Sommaire de la stratigraphie

Forage n°	Remblai		Sol organique		Sable graveleux		Sable	
	Niveau supérieur ¹ (m)	Épaisseur (m)	Niveau supérieur ¹ (m)	Épaisseur (m)	Niveau supérieur ¹ (m)	Épaisseur (m)	Niveau supérieur ¹ (m)	Épaisseur (m)
F-1	97,40	0,61	--	--	96,79	0,91	95,88	> 14,33
F-2	--	--	94,23	0,30	93,93	1,22	92,71	> 5,80
F-3	--	--	93,83	0,30	93,53	1,99	91,54	> 5,18
F-4	--	--	94,26	0,30	93,96	> 1,07	--	--

¹ : Niveau arbitraire -- : Couche non rencontrée ou non explorée

Les caractéristiques et les propriétés de ces unités stratigraphiques sont décrites dans les paragraphes qui suivent.

4.1 Remblai

Une couche de remblai d'une épaisseur de 0,61 m et composé de sable graveleux brun avec un peu de silt est présente au forage F-1.

4.2 Sol organique

Une couche de sol organique d'une épaisseur de 0,30 m est présente en surface du terrain au droit des forages F-2 à F-4.

4.3 Sable graveleux

Sous le remblai ou les sols organiques, un dépôt granulaire constitué de sable graveleux brun, traces de silt à silteux a été rencontré dans les 4 forages. L'épaisseur du dépôt de sable graveleux varie de 0,91 à 1,99 m dans les forages F-1 à F-3 et est supérieure à 1,07 m dans le forage F-4; l'échantillonnage a été interrompu dans ce dépôt sans complètement le traverser à l'endroit de ce forage.

L'indice de pénétration « N » a été mesuré à 5 occasions dans le dépôt de sable graveleux. Les valeurs obtenues sont comprises entre 2 et 11 coups pour un enfoncement de 300 mm, ce qui indique une compacité très lâche à moyenne.

4.4 Sable

Sous le sable graveleux, un dépôt granulaire constitué de sable brun, traces à un peu de silt et traces de gravier a été rencontré dans les forages F-1 à F-3. La granulométrie du dépôt de sable varie en fonction des forages et des profondeurs. Par exemple, le dépôt devient silteux vers 15,24 m de profondeur dans le forage F-1, alors que des couches plus graveleuses ont été observées à partir de 4,57 m de profondeur dans le forage F-2 et de 6,10 m de profondeur dans le forage F-3. L'épaisseur du dépôt de sable est supérieure à 14,33 m dans le forage F-1, à 5,80 m dans le forage F-2 et à 5,18 m dans le forage F-3.

L'indice de pénétration « N » a été mesuré à environ une trentaine d'occasions dans le dépôt de sable. Les valeurs obtenues sont comprises entre 5 et 21 coups pour un enfoncement de 300 mm, ce qui indique une compacité lâche à moyenne.

Des analyses granulométriques ont été effectuées sur 6 échantillons représentatifs de ce dépôt. Les courbes granulométriques sont présentées à la figure 3.1 de l'annexe 3. Les résultats indiquent un contenu en gravier de 0 % à 1 %, en sable de 88 % à 97 % et en particules fines (inférieures à 0,08 mm de diamètre) de 3 % à 12 %.

5 Eau souterraine

Le niveau de l'eau souterraine a été relevé le 26 avril 2016 dans les tubes d'observation laissés en place dans les forages F-1 à F-4. Les résultats sont présentés au tableau suivant.

Tableau 3 Niveau de l'eau souterraine

Forage n°	Niveau de la surface ¹ (m)	Niveau de l'eau souterraine en date du 26 avril 2016	
		Profondeur (m)	Niveau ¹ (m)
F-1	97,40	6,09	91,31
F-2	94,23	3,03	91,20
F-3	93,83	2,66	91,17
F-4	94,26	3,02	91,24

¹ Niveau arbitraire.

Les résultats des mesures du niveau de l'eau souterraine indiquent que la surface de la nappe est située à environ 0,2 à 0,3 m au-dessus du niveau du lac, lequel était au niveau d'environ 21 m, le 15 avril 2016, à proximité de la passerelle. L'écoulement des eaux souterraines se fait donc vers le lac avec un faible gradient hydraulique.

Il est important de souligner que le niveau de l'eau souterraine peut fluctuer à la hausse ou à la baisse et se situer à des profondeurs différentes selon les années, les saisons et les conditions climatiques (pluies abondantes, fonte des neiges, période de sécheresse, etc.), du niveau du lac Wapizagonke et des modifications apportées à l'environnement (excavation, pompage, etc.).

6 Commentaires et recommandations

6.1 Description du projet et des sols

6.1.1 Description du projet

Au moment de la rédaction du présent rapport, les détails concernant les travaux projetés n'étaient pas connus.

De façon générale, le projet consiste en la reconstruction de la passerelle no 2, située sur le sentier les Cascades. Le type de fondation actuelle et le design de la structure tel que construit sont présentés sur des plans fournis par le client. Ces plans portent le numéro de référence NCLM 72/R99 et sont datés du 29 novembre 1973. Les principales informations tirées des plans sont résumées ci-dessous de même que les informations non connues pertinentes au projet.

- › La passerelle piétonnière sera construite à l'emplacement de la passerelle existante.
- › Deux options de conception sont considérées par le concepteur, la première étant la même configuration que la passerelle existante, soit un système constitué de 2 appuis en rives droite et gauche et d'une pile centrale au droit du lac. La deuxième option consiste à supporter la passerelle uniquement au moyen de 2 appuis en rives gauche et droite.
- › Le système de fondations actuel consiste en des tuyaux en métal ondulé de diamètre variable et d'environ 1,8 à 4,5 m de longueur. Ces derniers sont remplis de béton. Le système de fondation présenté dans ce rapport consiste en des semelles superficielles.
- › Le talus en rive gauche a une pente d'environ 20° ($\approx 2,75 H : 1 V$) par rapport à l'horizontale alors que le talus en rive droite est incliné à environ 30° ($\approx 1,75 H : 1 V$).
- › Le niveau des futures fondations n'est pas connu.

6.1.2 Résumé de la stratigraphie

La stratigraphie du site à l'emplacement de la passerelle, telle que déterminée à l'endroit des 4 sondages, consiste principalement en un épais dépôt de sol granulaire de compacité lâche à moyenne. L'épaisseur de ce dernier n'a pas pu être déterminée puisque les forages ont été arrêtés sans l'avoir traversé complètement. Dans le forage le plus profond, soit le forage F-1, le dépôt granulaire a plus de 15,24 m d'épaisseur.

En rive droite, sous le tablier de la passerelle existante, la surface du roc probable a été observée. Toutefois, le profil du roc dans les environs du site de la future passerelle n'est pas connu.

6.2 Excavation temporaire

6.2.1 Inclinaisons des pentes temporaires

Il est recommandé que les pentes des excavations temporaires requises pour les travaux respectent les exigences du *Code de sécurité pour les travaux de construction* (2016) de la CSST. En effet, étant donné que la méthode de travail qui sera utilisée au chantier est présentement inconnue et puisqu'il s'agit de pentes temporaires d'excavation, leur stabilité ainsi que la sécurité des travailleurs, des ouvrages à construire et des structures existantes sont sous la responsabilité de l'entrepreneur.

Les parois de l'excavation doivent être vérifiées régulièrement afin de déceler tout élément susceptible de s'en détacher et constituer un danger pour les travailleurs. De plus, la circulation de véhicules et de la machinerie de chantier ainsi que le stockage de matériaux de construction et la mise en tas de sols excavés doivent être évités à proximité de la crête des excavations, et ce, sur une distance au moins égale à la profondeur des excavations. Le remblayage des excavations doit être effectué dans les meilleurs délais, pour éviter une dégradation des pentes exposées.

Selon la stratigraphie du site de la future passerelle, les excavations devraient être effectuées principalement dans le dépôt de sable et possiblement le roc. De plus, ces excavations seront exécutées dans le talus en bordure du lac Wapigazonke. Il est donc important que ces facteurs soient considérés (mais sans s'y limiter) dans la détermination des conditions d'excavation.

Les travaux d'excavation ne devront, en aucun cas, affecter l'intégrité des ouvrages existants (bâtiment existant, route, conduites, etc.). Un système adéquat de soutènement temporaire ou autre ouvrage de stabilisation doit être mis en œuvre aux endroits appropriés lorsque requis. À cet effet, il est impératif que la conception et les travaux de soutènement ou de stabilisation soient vérifiés et validés par un ingénieur spécialisé en géotechnique, particulièrement dans le cas d'excavation de profondeur et de pente importantes.

6.2.2 Assèchement

Le 26 avril 2016, le niveau de l'eau souterraine se trouvait au niveau d'environ 91,20 m au droit des forages. Compte tenu de la nature pulvérulente du matériau présent sur le site, et selon la profondeur qui sera atteinte dans les excavations, des venues d'eau pourraient survenir dans l'excavation. L'entrepreneur devra donc prévoir la mise en place d'un système d'assèchement des fouilles adéquat au besoin.

Dans tous les cas, l'entrepreneur doit prévoir les mesures appropriées pour rabattre le niveau de l'eau dans les sols granulaires d'au moins 0,5 m sous le fond de l'excavation. Ces mesures sont nécessaires pour éviter la déstabilisation des talus et du fond de l'excavation et permettre l'exécution des travaux dans des conditions adéquates.

6.3 Profondeur de gel

Dans le cas de la reconstruction d'une passerelle en remplacement de celle existante, tous les éléments de fondations devront être implantés à une profondeur minimale de 1,6 m sous le niveau final du terrain, afin que ceux-ci soient protégés des effets néfastes du gel dans les sols.

La protection contre le gel pourra également être assurée en utilisant un isolant thermique tel des panneaux de polystyrène conçus à cet effet. La conception de l'isolant thermique devra être faite en accord avec les recommandations du chapitre 13 du Manuel canadien d'ingénierie des fondations (4^e édition, 2013), en utilisant une valeur de l'indice de gel normal de 1440 °C-jours.

6.4 Considération sismique

La catégorie d'emplacement en fonction de la réponse sismique est déterminée selon les critères du tableau 4.1, de l'édition 2016 du Code canadien sur le calcul des ponts routiers. En tenant compte des critères indiqués à ce tableau et en considérant une stratigraphie simplifiée représentative des conditions de sol rencontrées au droit des forages F-1 à F-4, le site peut être classé de catégorie « D ».

Des analyses ont été effectuées afin de vérifier la susceptibilité à la liquéfaction des sols pulvérulents en place lors d'un séisme important. La méthode de calcul utilisée pour la détermination du potentiel de liquéfaction est celle proposée par Youd et al¹. Cette analyse a consisté à comparer la contrainte de cisaillement (CSR) induite dans le sol par un séisme donné à la résistance au cisaillement (CRR) disponible dans le sol lors de ce même séisme.

Le calcul du CSR a été obtenu à partir de l'accélération de pointe du sol (APS) calculée par la Commission géologique du Canada (valeur pour CNB 2015). Pour le site à l'étude, l'APS est de 0,144 g pour une probabilité annuelle de dépassement de 2 % en 50 ans.

Aux fins d'analyse, l'hypothèse d'un séisme de magnitude (Mw) 6,8 a été posée. Cette magnitude provient d'une analyse de désagrégation du risque sismique réalisée par « Séismes Canada » selon le modèle 2015.

Sous l'effet d'une telle secousse sismique, les calculs indiquent des facteurs de sécurité contre la liquéfaction supérieurs à l'unité.

6.5 Fondations

L'unité stratigraphique déterminante sur le site consiste en un dépôt de sable de compacité lâche à moyenne. Compte tenu de la nature de l'ouvrage projeté et des sols en place, un système de fondations superficielles pourra être considéré. Toutefois, si les capacités portantes

1 Youd, T. L. et al. « Liquefaction Resistance of Soils : Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils », *Journal of Geotechnical and Geoenvironmental Engineering*, vol. 127, n° 10, octobre 2001, p. 817-833.

fournies pour ce type de fondation sont trop faibles, il faudra analyser un système de fondations différent.

Les recommandations concernant les fondations sont appuyées sur le Code canadien sur le calcul des ponts routiers (S6-14).

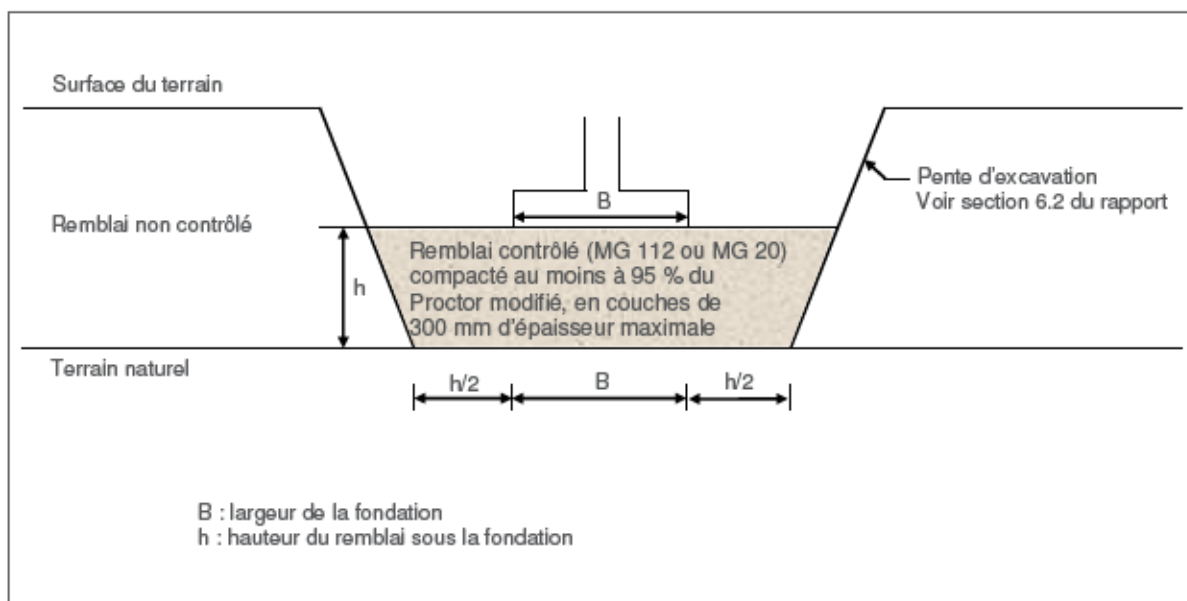
6.5.1 Préparation de l'assise des fondations

En considérant la stratigraphie rencontrée au droit des forages, il est recommandé d'implanter les fondations de la passerelle projetée dans le dépôt de sable contenant des traces à un peu de silt et des traces de gravier de compacité lâche à moyenne.

Les sols d'assise devront être asséchés, exempts de sols organiques, de débris, de remblai non contrôlé ou de sols gelés. Il est recommandé de limiter la circulation des équipements de chantier sur l'assise des fondations et de compacter le fond d'excavation servant comme assise des fondations à au moins 95 % du Proctor modifié.

Si requis, la différence entre le fond de l'excavation et le niveau projeté de la base des fondations devra être comblée avec un remblai contrôlé, constitué de matériaux granulaires de calibre MG 112 ou MG 20, mis en place par couche de 300 mm d'épaisseur maximale et compacté à 95 % du Proctor modifié. Comme montrée à la figure 5 ci-dessous, la largeur de la base du remblai contrôlé devrait être au moins égale à la largeur de la semelle de la fondation s'appuyant sur ce remblai contrôlé, additionnée de la hauteur de ce dernier. La semelle de la fondation devra être centrée par rapport au remblai contrôlé.

Figure 5 : Schéma montrant les dimensions du remblai contrôlé.



Il est recommandé de mettre en place un coussin d'assise de pierre concassée MG 20 ayant une épaisseur minimale de 150 mm directement sous les fondations. Cette couche sera compactée à 95 % du Proctor modifié.

Il est à souligner que les matériaux de remblayage utilisés devront nécessairement être non réactifs, c'est-à-dire exempts de minéraux potentiellement gonflants, tels que la pyrite. De plus, ces matériaux devront être certifiés « matériaux DB » selon les essais de caractérisation prescrits dans la norme BNQ 2560-510.

Le fond d'excavation devra être vérifié par un ingénieur spécialisé en géotechnique ou son représentant dès le début des travaux. Cette mesure a pour but de s'assurer que l'assise soit conforme aux recommandations de cette étude.

6.5.2 Résistance géotechnique ultime

Pour le calcul de la pression de la résistance géotechnique ultime (ÉLUL), le concepteur devra utiliser l'équation proposée à la section 6.10.2 de la S6-14. Dans cette équation de capacité portante, les coefficients de forme utilisés devront tenir compte du rapport de la largeur sur la longueur des semelles et des inclinaisons de la charge. Les formules permettant de calculer ces coefficients sont également détaillées dans la section 6.10.2 de la S6-14. Par ailleurs, le concepteur devra considérer les indications de l'article 10.2.2 du Manuel canadien d'ingénierie des fondations (MCIF), édition 2013, pour des conditions drainées, applicables à un dépôt de sol pulvérulent.

L'équation pourra être appliquée en utilisant les valeurs des paramètres présentées au tableau 4 suivant.

Tableau 4 : Paramètres géotechniques pour le calcul de la capacité portante aux ÉLUL

Type de sol d'assise	c'	ϕ'	N_c	N_q	$N\gamma^1$	Poids volumique, γ
Dépôt de sable	0 kPa	31°	33	21	19	17 kN/m ³

1 : Pour le cas où la base de la fondation est rugueuse (béton coulé en place par exemple).

Un coefficient de tenue géotechnique (Φ_{gu}) égal à 0,5 devra être appliqué à la valeur de la résistance géotechnique ultime pour obtenir la résistance géotechnique pondérée.

Compte tenu de la topographie du site et en fonction de la conception finale du système de fondation de la passerelle, il n'est pas à exclure que les fondations prennent appui dans le talus. À ce sujet, pour que les valeurs de capacité portantes à l'ÉLUL soient valides, l'extrémité extérieure de la base de la fondation de largeur B, située du côté du talus, devra être localisée à une distance horizontale égale ou supérieure à 5B de la face du talus.

6.5.3 Résistance géotechnique d'utilisation

Les valeurs recommandées de capacité portante aux états limites d'utilisation (ÉLUT) sont présentées au tableau 5 selon la largeur de la fondation. Sous les pressions mentionnées dans ce tableau, le tassement total anticipé sera inférieur à 25 mm. La capacité portante (ÉLUT) est définie comme étant la pression de contact sous la fondation qui peut être transmise au sol, en plus du poids actuel des terres. Tout poids additionnel de remblai en excès du poids actuel des terres devra être considéré. Par ailleurs, les valeurs de capacité portante incluent un coefficient de tenue géotechnique (ϕ_{gs}) égal à 0,8, comme recommandé pour un degré de compréhension typique dans la S6-14.

Tableau 5 : Capacité portante à l'ÉLUT pour des fondations superficielles

Largeur de la base des fondations, B ¹	Capacité portante
B = 2,0 m	125 kPa
B ≥ 3,0 m	100 kPa

¹ : La longueur des fondations (L) est prise égale à 5,0 m

Les valeurs de capacité portante présentées au tableau 5 pourraient être augmentées à l'aide d'un remblai structural.

6.5.4 Particularité du site

Comme mentionné précédemment, la surface probable du roc a été observée en rive droite. Toutefois, le profil de ce dernier n'est pas connu. Cependant, la possibilité de rencontrer le roc à faible profondeur au droit des futures excavations n'est pas à écarter. Il est suggéré de considérer cet aspect dans la conception des fondations de la nouvelle passerelle. Cet élément pourrait également influencer à la hausse le prix de la réalisation des travaux. À ce sujet, lorsque l'ingénierie de la future passerelle sera plus avancée, il pourrait être judicieux de faire des vérifications quant à la présence probable et à localisation du roc au droit des fondations projetées, en rive droite.

Par ailleurs, si l'option d'une unité de fondation au droit du lac est retenue, nous recommandons d'effectuer des forages complémentaires pour déterminer la nature des sols à cet endroit et la capacité portante à l'ÉLUL et l'ÉLUT.

6.6 Remblayage derrière les fondations

À l'arrière des fondations, le remblayage devra être effectué à l'aide d'un matériau non gélif et compactable de calibre MG 112, compacté jusqu'à 90 % de la valeur de référence obtenue à

l'essai Proctor modifié. Le remblai devra être construit en couches de 300 mm d'épaisseur maximale.

La surface du terrain fini autour des fondations devra être aménagée de façon à éloigner les eaux de ruissellement loin de ces fondations. À cet effet, tous les sols granulaires entourant les fondations doivent être recouverts en surface d'une couche de matériaux peu perméables permettant d'éviter l'infiltration des eaux.

De façon spécifique, les matériaux utilisés pour le remblayage et la compacité requise devront tenir compte, s'il y a lieu, des utilités prévues (accès, chemin, etc.) et être ajustés en conséquence. Des transitions adéquates (1 V : 3 H) devront également être aménagées au contact de matériaux au potentiel de gélivité différent.

6.7 Contrôle qualitatif

Nous recommandons que le contrôle de la qualité des matériaux (sols et béton) et de leur mise en place soient assurés par une firme spécialisée en ingénierie des matériaux.

Enfin, il est recommandé de faire vérifier le plan des fondations par un ingénieur en géotechnique.

Annexe 1

Portée du rapport

PORTÉE DU RAPPORT

1. UTILISATION DU RAPPORT

A. Utilisation du rapport : Le présent rapport a été préparé, et les travaux qui y sont mentionnés ont été réalisés par SNC-Lavalin GEM Québec inc. (SNC-Lavalin) exclusivement à l'intention du client (le Client) auquel le rapport est adressé, qui a pris part à l'élaboration de l'énoncé des travaux et en comprend les limites. La méthodologie, les conclusions, les recommandations et les résultats cités au présent rapport sont fondés uniquement sur l'énoncé des travaux et assujettis aux exigences en matière de temps et de budget, telles que décrites dans l'offre de services et/ou dans le contrat en vertu duquel le présent rapport a été émis. L'utilisation de ce rapport, le recours à ce dernier ou toute décision fondée sur son contenu par un tiers est la responsabilité exclusive de ce dernier. SNC-Lavalin n'est aucunement responsable de tout dommage subi par un tiers du fait de l'utilisation de ce rapport ou de toute décision fondée sur son contenu. Les conclusions, les recommandations et les résultats cités au présent rapport (i) ont été élaborés conformément au niveau de compétence normalement démontré par des professionnels exerçant des activités dans des conditions similaires de ce secteur, et (ii) sont déterminés selon le meilleur jugement de SNC-Lavalin en tenant compte de l'information disponible au moment de la préparation du présent rapport. Les services professionnels fournis au Client et les conclusions, les recommandations et les résultats cités au présent rapport ne font l'objet d'aucune autre garantie, explicite ou implicite. Les conclusions et les résultats cités au présent rapport sont valides uniquement à la date du rapport et peuvent être fondés, en partie, sur de l'information fournie par des tiers. En cas d'information inexacte, de la découverte de nouveaux renseignements ou de changements aux paramètres du projet, des modifications au présent rapport pourraient s'avérer nécessaires. Les résultats de cette étude ne constituent en aucune façon une garantie que le terrain à l'étude est exempt de toute contamination. Le présent rapport doit être considéré dans son ensemble, et ses sections ou ses parties ne doivent pas être vues ou comprises hors contexte. Si des différences venaient à se glisser entre la version préliminaire (ébauche) et la version définitive de ce rapport, cette dernière prévaudrait. Rien dans ce rapport n'est mentionné avec l'intention de fournir ou de constituer un avis juridique. Le contenu du présent rapport est de nature confidentielle et exclusive. Il est interdit à toute personne, autre que le Client, de reproduire ou de distribuer ce rapport, de l'utiliser ou de prendre une décision fondée sur son contenu, en tout ou en partie, sans la permission écrite expresse du Client et de SNC-Lavalin.

B. Modifications au projet : les données factuelles, les interprétations et les recommandations contenues dans ce rapport ont trait au projet spécifique tel que décrit dans le rapport et ne s'appliquent à aucun autre projet ni autre site. Si le projet est modifié du point de vue conception, dimensionnement, emplacement ou niveau, SNC-Lavalin devra être consulté de façon à confirmer que les recommandations déjà données demeurent valides et applicables.

C. Nombre de sondages : les recommandations données dans ce rapport n'ont pour but que de servir de guide à l'ingénieur en conception. Le nombre de sondages pour déterminer toutes les conditions souterraines qui peuvent affecter les travaux de construction (coûts, techniques, matériel, échancier), devrait normalement être plus élevé que celui pour les besoins du dimensionnement. Le nombre de points d'échantillonnage et d'analyses chimiques ainsi que la fréquence d'échantillonnage et le choix des paramètres peuvent influencer la nature et l'envergure des actions correctives ainsi que les techniques et les coûts de traitement ou de disposition. Les entrepreneurs qui soumissionnent ou qui sous-traitent le travail, devraient compter sur leurs propres études ainsi que sur leurs propres interprétations des résultats factuels des sondages pour apprécier de quelle façon les conditions souterraines peuvent affecter leur travail et les coûts des travaux.

D. Interprétation des données, commentaires et recommandations : à moins d'avis contraire, l'interprétation des données et des résultats, les commentaires et les recommandations contenus dans ce rapport sont fondés, au mieux de notre connaissance, sur les politiques, les critères et les règlements environnementaux en vigueur à l'emplacement du projet et à la date de production du rapport. Si ces politiques, critères et règlements font l'objet de modifications après la soumission du rapport, SNC-Lavalin devra être consulté pour réviser les recommandations à la lumière de ces changements. Lorsqu'aucune politique, critère ou réglementation n'est disponible pour permettre l'interprétation des données et des résultats analytiques, les commentaires ou recommandations exprimés par SNC-Lavalin sont basés sur la meilleure connaissance possible des règles acceptées dans la pratique professionnelle. Les analyses, commentaires et recommandations contenus dans ce rapport sont fondés sur les données et observations recueillies sur le site, lesquelles proviennent de travaux d'échantillonnage effectués sur le site. Il est entendu que seules les données directement recueillies à l'endroit des sondages, des sites d'échantillonnage et à la date de l'échantillonnage sont exactes et que toute interpolation ou extrapolation de ces résultats à l'ensemble ou à une partie du site comporte des risques d'erreurs qui peuvent elles-mêmes influencer la nature et l'ampleur des actions requises sur le site.

2. RAPPORTS DE SONDRAGE ET INTERPRÉTATION DES CONDITIONS SOUTERRAINES

A. Description des sols et du roc : les descriptions des sols et du roc données dans ce rapport proviennent de méthodes de classification et d'identification communément acceptées et utilisées dans la pratique de la géotechnique. La classification et l'identification du sol et du roc font appel à un jugement. SNC-Lavalin ne garantit pas que les descriptions seront identiques en tout point à celles faites par un autre géotechnicien possédant les mêmes connaissances des règles de l'art en géotechnique, mais assure une exactitude seulement à ce qui est communément utilisé dans la pratique de la géotechnique.

B. Conditions des sols et du roc à l'emplacement des sondages : les rapports de sondage ne fournissent que des conditions du sous-sol à l'emplacement des sondages seulement. Les limites entre les différentes couches sur les rapports de sondage sont souvent approximatives, correspondant plutôt à des zones de transition, et ont donc fait l'objet d'une interprétation. La précision avec laquelle les conditions souterraines sont

indiquées, dépend de la méthode de sondage, de la fréquence et de la méthode d'échantillonnage ainsi que de l'uniformité du terrain rencontré. L'espacement entre les sondages, la fréquence d'échantillonnage et le type de sondage sont également le reflet de considérations budgétaires et de délais d'exécution qui sont hors du contrôle de SNC-Lavalin

C. Conditions des sols et du roc entre les sondages : les formations de sol et de roc sont variables sur une plus ou moins grande étendue. Les conditions souterraines entre les sondages sont interpolées et peuvent varier de façon significative des conditions rencontrées à l'endroit des sondages. SNC-Lavalin ne peut en effet garantir les résultats qu'à l'endroit des sondages effectués. Toute interprétation des conditions présentées entre les sondages comporte des risques. Ces interprétations peuvent conduire à la découverte de conditions différentes de celles qui étaient prévues. SNC-Lavalin ne peut être tenu responsable de la découverte de conditions de sol et de roc différentes de celles décrites ailleurs qu'à l'endroit des sondages effectués.

D. Niveaux de l'eau souterraine : les niveaux de l'eau souterraine donnés dans ce rapport correspondent seulement à ceux observés à l'endroit et à la date indiqués dans le rapport. Ces conditions peuvent varier de façon saisonnière ou suite à des travaux de construction sur le site ou sur des sites adjacents. Ces variations sont hors du contrôle de SNC-Lavalin

3. NIVEAUX DE CONTAMINATION

Les niveaux de contamination décrits dans ce rapport correspondent à ceux détectés à l'endroit et à la date indiqués dans le rapport. Ces niveaux peuvent varier selon les saisons ou par suite d'activités sur le site à l'étude ou sur des sites adjacents. Ces variations sont hors de notre contrôle. Les niveaux de contamination sont déterminés à partir des résultats des analyses chimiques effectuées sur un nombre limité d'échantillons de sol, d'eau de surface ou d'eau souterraine. La nature et le degré de contamination entre les points d'échantillonnage peuvent varier de façon importante de ceux à ces points. La composition chimique des eaux souterraines à chaque point d'échantillonnage est susceptible de changer en raison de l'écoulement souterrain, des conditions de recharge par la surface, de la sollicitation de la formation investiguée (i.e. puits de pompage ou d'injection à proximité du site) ainsi que de la variabilité saisonnière naturelle. La précision des niveaux de contamination de l'eau souterraine dépend de la fréquence et du nombre d'analyses effectuées. La liste des paramètres analysés est basée sur notre meilleure connaissance de l'histoire du site et des contaminants susceptibles d'être trouvés sur le site et est également le reflet de considérations budgétaires et de délais d'exécution. Le fait qu'un paramètre n'ait pas été analysé n'exclut pas qu'il soit présent à une concentration supérieure au bruit de fond ou à la limite de détection de ce paramètre.

4. SUM DE L'ÉTUDE ET DES TRAVAUX

A. Vérification en phase finale : tous les détails de conception et de construction ne sont pas connus au moment de l'émission du rapport. Il est donc recommandé que les services de SNC-Lavalin soient retenus pour apporter toute la lumière sur les conséquences que pourraient avoir les travaux de construction sur l'ouvrage final.

B. Inspection durant l'exécution : il est recommandé que les services de SNC-Lavalin soient retenus pendant la construction, pour vérifier et confirmer d'une part que les conditions souterraines sur toute l'étendue du site ne diffèrent pas de celles données dans le rapport et d'autre part, que les travaux de construction n'auront pas un effet défavorable sur les conditions du site.

5. CHANGEMENT DES CONDITIONS : les conditions de sol décrites dans ce rapport sont celles observées au moment de l'étude. À moins d'indication contraire, ces conditions forment la base des recommandations du rapport. Les conditions de sol peuvent être modifiées de façon significative par les travaux de construction (trafic, excavation, etc.) sur le site ou sur les sites adjacents. Une excavation peut exposer les sols à des changements dus à l'humidité, au séchage ou au gel. Sauf indication contraire, le sol doit être protégé de ces changements ou remaniements pendant la construction. Lorsque les conditions rencontrées sur le site diffèrent de façon significative de celles prévues dans ce rapport, dues à la nature hétérogène du sous-sol ou encore à des travaux de construction, il est du ressort du Client et de l'utilisateur de ce rapport de prévenir SNC-Lavalin des changements et de fournir à SNC-Lavalin l'opportunité de réviser les recommandations de ce rapport. Reconnaître un changement des conditions de sol demande une certaine expérience. Il est donc recommandé qu'un ingénieur géotechnicien expérimenté soit dépêché sur le site afin de vérifier si les conditions ont changé de façon significative.

6. DRAINAGE : le drainage de l'eau souterraine est souvent requis aussi bien pour des installations temporaires que permanentes du projet. Une conception ou exécution impropre du drainage peut avoir de sérieuses conséquences. SNC-Lavalin ne peut en aucun cas prendre la responsabilité des effets du drainage à moins que SNC-Lavalin ne soit spécifiquement impliqué dans la conception détaillée et le suivi des travaux de construction du système de drainage.

7. CARACTÉRISATION ENVIRONNEMENTALE – PHASE I (Phase II) : Ce rapport a été rédigé suite à des activités de recherche diligentes et à partir d'une évaluation de sources de données ponctuelles ou des renseignements obtenus auprès de tiers et qui peuvent comporter des incertitudes, lacunes ou omissions. Ces sources d'informations sont sujettes à des modifications au fil du temps, par exemple, selon l'évolution des activités sur le terrain à l'étude et ceux environnants. La Phase I n'inclut aucun essai, échantillonnage ou analyse de caractérisation par un laboratoire. Sauf exception, la Phase I s'appuie sur l'observation des composantes visibles et accessibles sur la propriété et celles voisines et qui pourraient porter un préjudice environnemental à la qualité du terrain à l'étude. Les titres de propriété mentionnés dans ce rapport sont utilisés pour identifier les anciens propriétaires du site à l'étude et ils ne peuvent en aucun cas être considérés comme document officiel pour reproduction ou d'autres types d'usages. Enfin, tout croquis, vue en plan ou schéma apparaissant dans le rapport ou tout énoncé spécifiant des dimensions, capacités, quantités ou distances sont approximatifs et sont inclus afin d'assister le lecteur à visualiser la propriété.

Annexe 2

Notes explicatives et rapports de forage
Rapports de forage F-1 à F-4



Un rapport de sondage permet de résumer la stratigraphie des sols et du roc, leurs propriétés ainsi que les conditions d'eau souterraine. Cette note a pour but d'expliquer la terminologie, les symboles et abréviations utilisés.

COUPE STRATIGRAPHIQUE

1. PROFONDEUR – NIVEAU

La profondeur et le niveau des différents contacts stratigraphiques sont donnés par rapport à la surface du terrain à l'endroit des sondages au moment de leur exécution. Les niveaux sont indiqués en fonction d'un système indiqué dans l'entête du rapport de sondage.

2. DESCRIPTION DES SOLS

Les sols sont décrits selon leur nature et leurs propriétés géotechniques.

Les dimensions des particules constituant un sol sont les suivantes :

NOM	DIMENSION (mm)	
Argile	<	0,002
Silt	0,002 -	0,08
Sable	0,08 -	5
Gravier	5 -	80
Caillou	80 -	300
Bloc	>	300

La proportion des divers éléments de sol, définis selon la dimension des particules, est donnée d'après la terminologie descriptive suivante :

TERMINOLOGIE DESCRIPTIVE	PROPORTION DE PARTICULES (%)	
Traces	1 -	10
Un peu	10 -	20
Adjectif (ex. : sableux, silteux)	20 -	35
Et (ex. : sable et gravier)	>	35

2.1 COMPACTITÉ DES SOLS PULVÉRULENTS

La compacité des sols pulvérulents est évaluée à l'aide de l'indice de pénétration « N » obtenu par l'essai de pénétration standard :

COMPACTITÉ	INDICE DE PÉNÉTRATION « N » (coups / 300 mm)	
Très lâche	<	4
Lâche	4 -	10
Compacte ou moyenne	10 -	30
Dense	30 -	50
Très dense	>	50

2.2 CONSISTANCE ET PLASTICITÉ DES SOLS COHÉRENTS

La consistance des sols cohérents est évaluée à partir de la résistance au cisaillement. La résistance au cisaillement non drainé de l'argile intacte (s_u) et de l'argile remaniée (s_r) est mesurée en chantier ou en laboratoire.

CONSISTANCE	RÉSISTANCE AU CISAILLEMENT, s_u (kPa)	
Très molle	<	12
Molle	12 -	25
Ferme	25 -	50
Raide	50 -	100
Très raide	100 -	200
Dure	>	200

PLASTICITÉ	LIMITE DE LIQUIDITÉ, w_L (%)	
Faible	<	30
Moyenne	30 -	50
Élevée	>	50

3. DESCRIPTION DU ROC

Le roc est décrit en fonction de sa nature géologique, de ses caractéristiques structurales et de ses propriétés mécaniques.

L'indice de qualité du roc (RQD) est déterminé selon la norme ASTM D 6032.

CLASSIFICATION	INDICE DE QUALITÉ RQD (%)	
Très mauvaise qualité	<	25
Mauvaise qualité	25 -	50
Qualité moyenne	50 -	75
Bonne qualité	75 -	90
Excellente qualité	90 -	100

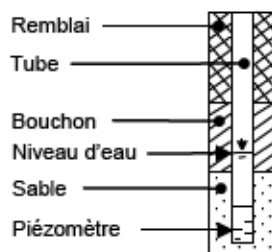
JOINTS	ESPACEMENT MOYEN (mm)	
Très rapprochés	0 -	60
Rapprochés	60 -	200
Moyennement espacés	200 -	600
Espacés	600 -	2000
Très espacés	>	2000

RÉSISTANCE	RÉSISTANCE À LA COMPRESSION UNIAXIALE, q_u (MPa)	
Extrêmement faible	<	1
Très faible	1 -	5
Faible	5 -	25
Moyennement forte	25 -	50
Forte	50 -	100
Très forte	100 -	250
Extrêmement forte	>	250



NIVEAU D'EAU

La colonne « Niveau d'eau » indique le niveau de l'eau souterraine mesuré dans un tube d'observation, un piézomètre, un puits d'observation ou directement dans un sondage. La date du relevé est également indiquée dans cette colonne. Le croquis ci-contre illustre les différents symboles utilisés.



ABRÉVIATIONS

A	Absorption, L/min-m (essai d'eau sous pression)
AC	Analyses chimiques
C	Essai de consolidation
C _c	Coefficient de courbure
C _u	Coefficient d'uniformité
s _u	Résistance au cisaillement à l'état intact, mesurée au scissomètre de chantier, kPa
s _r	Résistance au cisaillement à l'état remanié, mesurée au scissomètre de chantier, kPa
s _{us}	Résistance au cisaillement à l'état intact, mesurée au pénétromètre à cône (cône suédois), kPa
s _{rs}	Résistance au cisaillement à l'état remanié, mesurée au pénétromètre à cône (cône suédois), kPa
s _{up}	Résistance au cisaillement à l'état intact, mesurée au scissomètre portatif, kPa
s _{rp}	Résistance au cisaillement à l'état remanié, mesurée au scissomètre portatif, kPa
D _r	Densité relative des particules solides
E _M	Module pressiométrique, kPa ou MPa
G	Analyse granulométrique par tamisage et lavage
I _L	Indice de liquidité
I _p	Indice de plasticité, %
k _c	Coefficient de perméabilité (conductivité hydraulique) mesuré en chantier, m/s
k _L	Coefficient de perméabilité (conductivité hydraulique) mesuré en laboratoire, m/s
N _{dc}	Indice de pénétration (essai de pénétration dynamique au cône, DCPT)
N	Indice de pénétration (essai de pénétration standard, SPT)
P ₈₀	Analyse granulométrique par lavage au tamis 80 µm
P _L	Pression limite de l'essai pressiométrique, kPa
P _r	Essai Proctor
γ	Poids volumique, kN/m ³
γ'	Poids volumique déjaugé, kN/m ³
q _u	Résistance à la compression uniaxiale du roc, MPa
R	Refus à l'enfoncement du carottier fendu
S	Analyse granulométrique par sédimentométrie
S _t	Sensibilité (s _u /s _r)
T.A.S.	Taux d'agressivité du sol
w	Teneur en eau, %
w _L	Limite de liquidité, %
w _p	Limite de plasticité, %

ÉCHANTILLONS

1. TYPE ET NUMÉRO

La colonne « Type et numéro » correspond à la numérotation de l'échantillon. Il comprend deux lettres identifiant le type d'échantillonnage, suivi d'un chiffre séquentiel. Les types d'échantillonnage sont les suivants :

CF : carottier fendu	CR : carottier diamanté
CG : carottier grand diamètre	VR : prélèvement manuel
TM : tube à paroi mince	ET : tarière
TU : tube échantillonneur en plastique (Geoprobe)	

2. ÉTAT

La profondeur, la longueur et l'état de chaque échantillon sont indiqués dans cette colonne. Les symboles suivants illustrent l'état de l'échantillon :



3. RÉCUPÉRATION

La récupération de l'échantillon correspond à la longueur récupérée de l'échantillon par rapport à la longueur de l'enfoncement de l'échantillonneur, exprimée en pourcentage.

ESSAIS IN SITU ET EN LABORATOIRE

Les résultats des essais effectués en chantier et en laboratoire sont indiqués dans les colonnes « Essais in situ et en laboratoire » à la profondeur correspondante.

La liste d'abréviations suivante sert à identifier ces essais.

CLIENT : Agence Parcs Canada
 PROJET : Reconstruction de la passerelle no. 2, sentier Les Cascades
 ENDROIT : Parc National de la Mauricie
 DOSSIER : 637126

FORAGE : F-1

DATE : 2016-04-13

COORDONNÉES : SCoPQ NAD 83

E: 342 575

N: 5 170 437

PROFONDEUR (m)	NIVEAU (m) ARBITRAIRE	DESCRIPTION	NIVEAU D'EAU 2016-04-26	ÉCHANTILLONS		ESSAIS IN SITU ET EN LABORATOIRE													
				TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou ROD (%)	TENEUR EN EAU ET LIMITES D'ATTERBERG (%)		AUTRES ESSAIS	S _u (kPa)								
								W _p	W _L		▲ S _u (kPa)	▼ S _u (kPa)							
	97.40																		
0.61	96.79	<u>Remblai:</u> Sable graveleux brun, un peu de silt.		CF-1		50													
1		<u>Sable:</u> Sable graveleux et silteux brun. Compacité très lâche.		CF-2		50	2												
1.52	95.88	<u>Sable:</u> Sable brun, traces à un peu de silt et traces de gravier. Compacité lâche à moyenne.		CF-3		75	5												
2				CF-4		50	7												
3				CF-5		82	8												
4		Présence de racines vers 4 m de profondeur.		CF-6		75	7												
5				CF-7		82	7												
6				CF-8		82	10												
6.09	91.31			CF-9		66	12												
7				CF-10		75	9												
8				CF-11		100	9												

REMARQUES : Sol gelé jusqu'à 0,3 m de profondeur.
 Les niveaux indiqués font référence à une grille arbitraire avec comme repère au niveau 100,00 m, le dessus de la dalle de béton à la porte d'entrée du nouveau restaurant.

MÉTHODE DE FORAGE : Rotation simultanée d'un tubage de calibre NW et d'un trépan.

CLIENT : Agence Parcs Canada
PROJET : Reconstruction de la passerelle no. 2, sentier Les Cascades
ENDROIT : Parc National de la Mauricie
DOSSIER : 637126

FORAGE : F-2

DATE : 2016-04-14

COORDONNÉES : SCoPQ NAD 83

E: 342 514

N: 5 170 439

PROFONDEUR (m)	NIVEAU (m) ARBITRAIRE	DESCRIPTION	NIVEAU D'EAU 2016-04-26	ÉCHANTILLONS		ESSAIS IN SITU ET EN LABORATOIRE				
				TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou ROD (%)	TENEUR EN EAU ET LIMITES D'ATTERBERG (%)		AUTRES ESSAIS
						$\frac{w_p}{w_L}$				
						20	40	60	80	ΔS_u (kPa) ∇S_{u0} (kPa) ΔS_r (kPa) ∇S_{r0} (kPa) $\bullet N_{60}$ (coups/300 mm)
						20	40	60	80	
	94.23									
0.30	93.93	Sol organique.		1a	X	82	4			
				1b	X					
		<u>Sable:</u> Sable brun, un peu de gravier à graveleux et traces de silt. Compacité lâche.			X	82	8			
1.52	92.71				X	57	7	⊙ 21		G
		<u>Sable:</u> Sable brun, traces à un peu de silt et traces de gravier. Compacité lâche à moyenne.			X	50	11			
					X	50	12			
3.03	91.20				X	33	8			
					X	0	11			
		Gravier intercepté vers 5 m de profondeur.			X	50	11	⊙ 24		G
					X	41	14			
6.10	88.13				X	100	15			
		<u>Sable:</u> Sable brun, un peu de gravier à graveleux, traces de silt. Compacité moyenne.								
7.32	86.91	Arrêt du forage.								

REMARQUES : Sol gelé jusqu'à 0,3 m de profondeur.
 Les niveaux indiqués font référence à une grille arbitraire avec comme repère au niveau 100,00 m, le dessus de la dalle de béton à la porte d'entrée du nouveau restaurant.

MÉTHODE DE FORAGE : Forage réalisé par percussion et lavage.

CLIENT : Agence Parcs Canada
 PROJET : Reconstruction de la passerelle no. 2, sentier Les Cascades
 ENDROIT : Parc National de la Mauricie
 DOSSIER : 637126

FORAGE : F-3

DATE : 2016-04-14

COORDONNÉES : SCoPQ NAD 83

E: 342 513

N: 5 170 449

PROFONDEUR (m)	NIVEAU (m) ARBITRAIRE	DESCRIPTION	NIVEAU D'EAU 2016-04-26	ÉCHANTILLONS		ESSAIS IN SITU ET EN LABORATOIRE													
				TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou ROD (%)	TENEUR EN EAU ET LIMITES D'ATTERBERG (%)		AUTRES ESSAIS									
						w_p w_L 		▲ S_u (kPa) ▼ S_{u0} (kPa) △ S_r (kPa) ▽ S_{r0} (kPa)											
								● N_{60} (coups/300 mm)											
0.30	93.53	Sol organique.		CF-1	1a	8	7												
		Sable: Sable graveleux brun, traces de silt. Compacité lâche à moyenne.		CF-2	1b		50	10											
				CF-3			66	11											
2.29	91.54			CF-4			66	9											
2.66	91.17	Sable: Sable brun, traces à un peu de silt et traces de gravier. Compacité lâche à moyenne.		CF-5			33	6	25		G								
				CF-6			100	8											
				CF-7			66	18											
5.33	88.50	Sable: Sable silteux, brun-roux. Compacité moyenne.		CF-8			100	12											
6.10	87.73	Sable: Sable graveleux à gravier sableux, brun. Compacité moyenne.		CF-9			25	18											
				CF-10			66	15											
7.47	86.36	Arrêt du forage.																	

REMARQUES : Sol gelé jusqu'à 0,2 m de profondeur.
 Les niveaux indiqués font référence à une grille arbitraire avec comme repère au niveau 100,00 m, le dessus de la dalle de béton à la porte d'entrée du nouveau restaurant.

MÉTHODE DE FORAGE : Forage réalisé par percussion et lavage.

CLIENT : Agence Parcs Canada
 PROJET : Reconstruction de la passerelle no. 2, sentier Les Cascades
 ENDROIT : Parc National de la Mauricie
 DOSSIER : 637126

FORAGE : F-4

DATE : 2016-04-15
 COORDONNÉES : SCoPQ NAD 83
 E: 342 565 N: 5 170 440

PROFONDEUR (m)	NIVEAU (m) ARBITRAIRE	DESCRIPTION	NIVEAU D'EAU 2016-04-26	ÉCHANTILLONS		ESSAIS IN SITU ET EN LABORATOIRE			
				TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou ROD (%)	TENEUR EN EAU ET LIMITES D'ATTERBERG (%)	AUTRES ESSAIS
						w_p w_L 		▲ S_u (kPa) ▼ S_{u0} (kPa) △ S_r (kPa) ▽ S_{r0} (kPa) ● N_{60} (coups/300 mm)	
						20 40 60 80		20 40 60 80	
0.30	93.96	Sol organique.		CF-1	1a	33	5		
		Sable: Sable graveleux, brun. Compacité lâche.		CF-2	1b	100	9		
1.37	92.89	Arrêt de l'échantillonnage. Essai de pénétration dynamique.							
3.02	91.24								
7.62	86.64	Arrêt de l'essai de pénétration dynamique.							

REMARQUES : Sol gelé jusqu'à 0,3 m de profondeur.
 Les niveaux indiqués font référence à une grille arbitraire avec comme repère au niveau 100,00 m, le dessus de la dalle de béton à la porte d'entrée du nouveau restaurant.

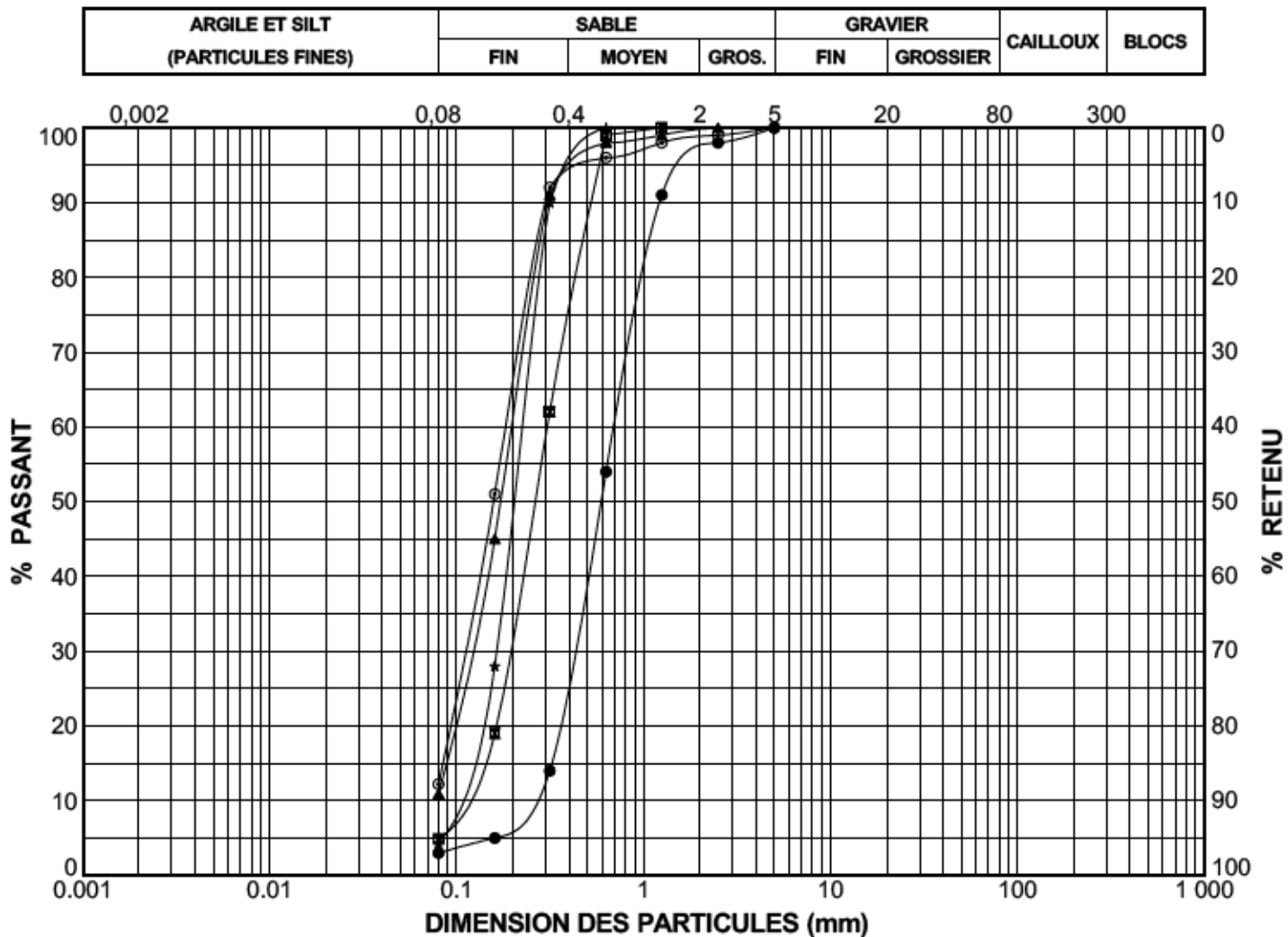
MÉTHODE DE FORAGE : Forage réalisé par percussion et lavage.

Annexe 3

Résultats des essais en laboratoire, figure 3.1

CLIENT : Agence Parcs Canada
PROJET : Reconstruction de la passerelle no. 2, sentier Les Cascades
ENDROIT : Parc National de la Mauricie
DOSSIER : 637126

Figure 3.1, page 1 de 2

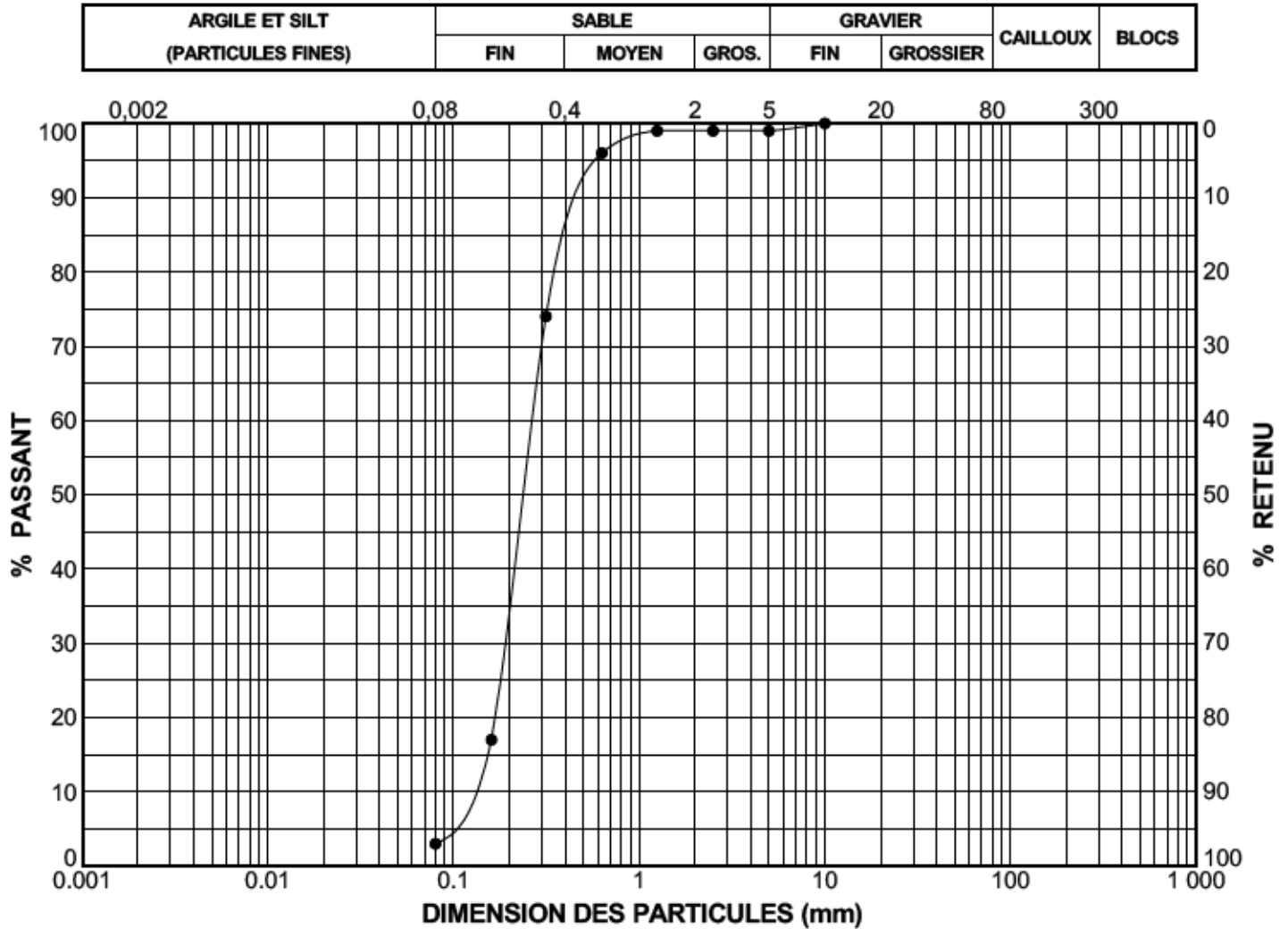


Sondage	Éch.	Profondeur (m)		Gravier (%)	Sable (%)	Silt et argile (%)	Description	
		de	à					
●	F-1	CF-3	1.52	2.13	0	97	3	Sable, traces de silt
■	F-1	CF-7	4.57	5.18	0	95	5	Sable, traces de silt
▲	F-1	CF-11	7.62	8.23	0	89	11	Sable, un peu de silt
★	F-2	CF-3	1.52	2.13	0	96	4	Sable, traces de silt
⊙	F-2	CF-8	5.33	5.94	0	88	12	Sable, un peu de silt

REMARQUES :

CLIENT : Agence Parcs Canada
PROJET : Reconstruction de la passerelle no. 2, sentier Les Cascades
ENDROIT : Parc National de la Mauricie
DOSSIER : 637126

Figure 3.1, page 2 de 2

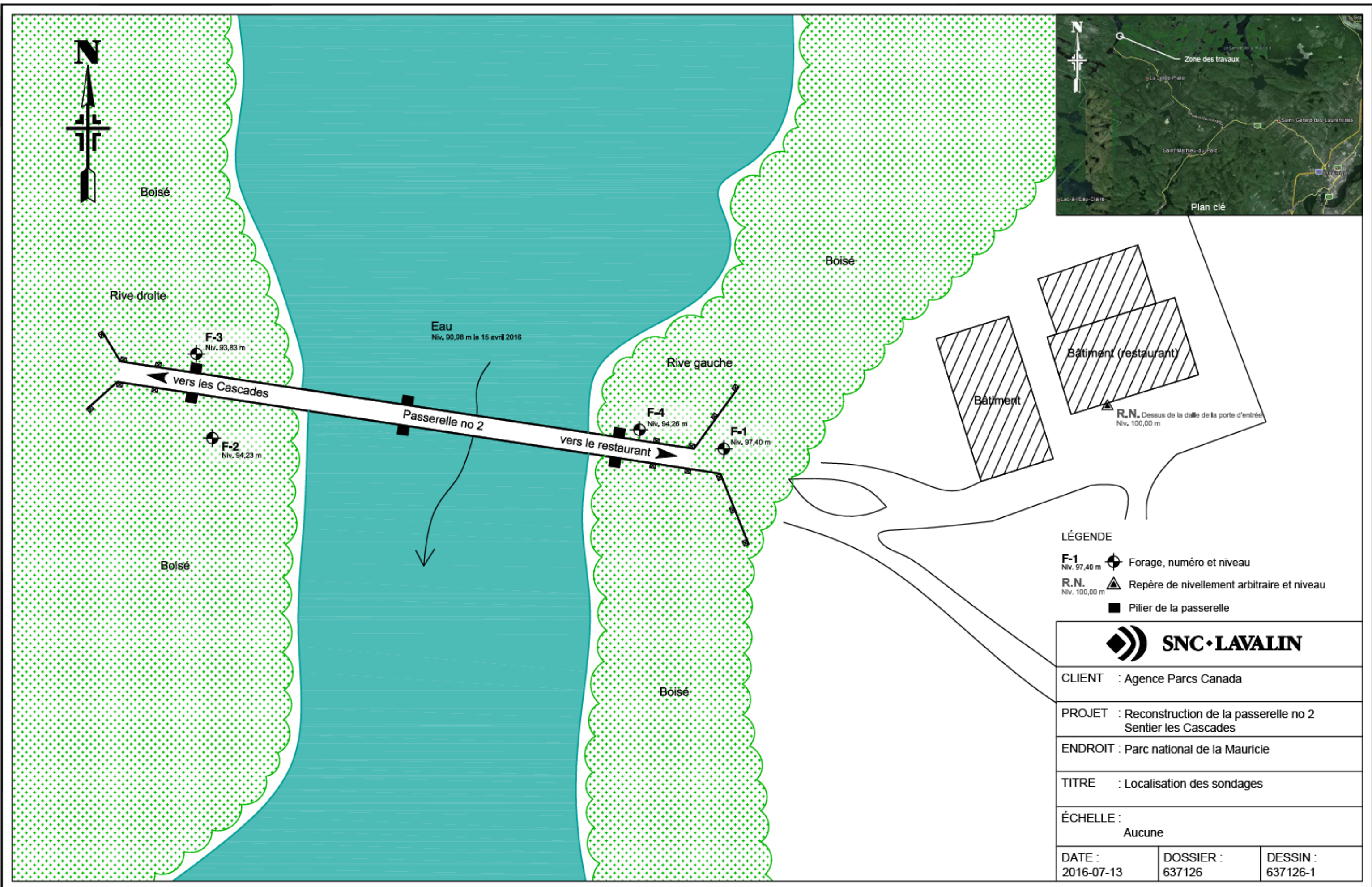


Sondage	Éch.	Profondeur (m)		Gravier (%)	Sable (%)	Silt et argile (%)	Description
		de	à				
● F-3	CF-5	3.05	3.66	1	96	3	Sable, traces de silt et de gravier

REMARQUES :

Annexe 4

Localisation des sondages 637126-1





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