



PARKS CANADA AGENCY

**Culverts Replacement on
The Parkway Road at
La Mauricie National Park**

N/Ref. client: 45332071

ISSUED FOR TENDER 100%

***TECHNICAL SPECIFICATIONS
CIVIL***


September 27th, 2013
N/Ref.: 056P0004134-0300-VR-0001-00

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**Culverts replacement on the Parkway Road
at La Mauricie National Park**

**TECHNICAL SPECIFICATIONS
CIVIL**

Prepared by :  
 2013-09-27

Approved by :  
 Project Manager
 13-09-27

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REGISTER OF REVISION AND ISSUE		
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P0004134300VRCV3D_01	Replacement of culvert RP_02010	00
P0004134300VRCV3D_02	Replacement of culvert RP_06624	00
P0004134300VRCV3D_03	Replacement of culvert RP_42650	00
P0004134300VRCV3D_04	Replacement of culvert RP_44681	00
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SECTION A : TECHNICAL SPECIFICATIONS

Part 1 General

1.1 RELATED SECTIONS

- .1 Submittal Procedures Section 01 33 00

1.2 SCHEDULE OF WORK

- .1 Works must be carried out from Monday to Friday between 07:00 and 17:00.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The work covered by this contract and concerning replacement of culverts at La Mauricie National Park include without limitation;
- .1 The replacement of existing culverts, including the removal and disposal of existing culverts and the provision of reinforced concrete culverts including their precast concrete head walls;
 - .2 Excavations required for the installation works;
 - .3 Backfill the excavations and compaction as shown on drawings details;
 - .4 The cleaning of existing ditches, if required;
 - .5 The reshaping of existing ditches, if required;
 - .6 Rip rap protection including geotextile;
 - .7 All surface repairs;
 - .8 Environmental measures for work streams.

1.4 CONTRACT METHOD

- .1 Construct Work under lump sum contract for each culvert;
- .2 Some provisional items are priced per unit.

1.5 WORK BY OTHERS

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

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1.6 WORK SEQUENCE

- .1 Perform the work by steps, so that the owner can use the site continuously during the work.
- .2 Co-ordinate the timetable for progress according to occupation of the premises by the owner during the construction.

1.7 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work and access, to allow Owner occupancy;
- .2 Co-ordinate use of premises under direction of the Representative of Parks Canada;
- .3 The Contractor shall limit deforestation as possible, and to adjust its working methods and machinery as well, all as directed by the Representative of Parks Canada;
- .4 Provide open to traffic during the culvert work RP_02010. The Contractor shall provide in its working methods, limiting trench openings, provide temporary and security retaining wall, provide the keeping the vehicular traffic;
- .5 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .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 Departmental Representative.
- .8 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.8 OWNER OCCUPANCY

- .1 The Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.9 EXISTING SERVICES

- .1 The Contractor shall protect and support existing public utilities, cables, underground concrete structures, electric and telephone poles. The Contractor shall be liable for breach of existing structures and will replace at its own costs

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- .2 Provide alternative routes for personnel and vehicular traffic considering of public utility services to support and protect.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify the Representative of Parks Canada of findings.
- .4 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .5 Where unknown services are encountered, immediately advise the Representative of Parks Canada and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

1.10 DOCUMENTS REQUIRED

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

SUMMARY OF WORK

END OF SECTION

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Part 1 General

1.1 PRECEDENCE

- .1 In the case of work carried out for the federal Government, the Division 1 sections take precedence over the technical sections of the other divisions of the project quotation.

1.2 DEFINITION

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

1.3 REQUIREMENTS

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

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- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 MASTER PLAN

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

1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award,
 - .2 Shop Drawings, Samples,
 - .3 Permits,
 - .4 Mobilization,
 - .5 Topographic survey,
 - .6 Excavation, stockpile materials to reuse and removal and disposal of existing materials,
 - .7 Install culverts, head walls and other materials
 - .8 Backfill,
 - .9 Finish earthwork and riprap protection,
 - .10 All surfaces repairs,

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- .11 Reconstruction of the road pavement and guard rails
- .12 Corrections of defects.

1.7 PROJECT SCHEDULE REPORTING

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

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOTE USED

- .1 Not used.

END OF SECTION

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Part 1 General

1.1 RELATED SECTIONS

- | | | |
|----|--------------------------|------------------|
| .1 | Summary of Work | Section 01 11 00 |
| .2 | Safety Requirements | Section 01 70 12 |
| .3 | Environmental Procedures | Section 01 35 43 |
| .4 | Hazardous Materials | Section 02 81 01 |

1.2 ADMINISTRATIVE

- .1 Submit to the Representative of Parks Canada 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 the Representative of Parks Canada. 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 the Representative of Parks Canada, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by the Representative of Parks Canada review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the Representative of Parks Canada review.
- .10 Keep one reviewed copy of each submission on site.

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1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 7 days for the Representative of Parks Canada review of each submission.
- .5 Adjustments made on shop drawings by the Representative of Parks Canada are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Representative of Parks Canada prior to proceeding with Work.
- .6 Make changes in shop drawings as the Representative of Parks Canada may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

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- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After the Representative of Parks Canada review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as the Representative of Parks Canada may reasonably request.
- .11 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by the Representative of Parks Canada.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by the Representative of Parks Canada, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .15 The review of shop drawings by the Representative of Parks Canada is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Parks Canada Agency approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of

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responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 PRIORITY

- .1 In case of work carried out for the federal Government, the Division 1 sections take precedence over the technical sections of the other divisions of the project quotation.

1.2 ENVIRONMENTAL CHARACTERIZATION OF SOIL SUMMARY

- .1 The contractor shall refer to the "Caractérisation environnementale sommaire des sols" provided in annex and implement any mitigation measures prescribed for each activity.

1.3 FIRES

- .1 Fires and burning of rubbish is forbidden.

1.4 DISPOSAL OF WATES

- .1 Do not bury rubbish and waste materials on Parks Canada property.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
- .3 Waste must be evacuated outside the Parks Canada property while respecting regulations federal and provincial environmental protection. Waste materials also include demolition material not withhold by Parks Canada, hazardous materials (liquid and solid) and water containing suspended solids.

1.5 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water. The Contractor must obtain the authorization from the Representative of Parks Canada concerning the localization of the permitted reject points.
- .2 Do not pump water containing suspended materials, if not previously properly filtered, into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances, according to local regulations.
- .4 The Contractor shall keep a flow at the river downstream of the work area.
- .5 The watercourse bed must regain original profile after work

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1.6 TREES, SHRUBS AND PLANT PROTECTION

- .1 Protect trees, shrubs and plants on site and adjacent properties where indicated. Any plantation that the Representative of Parks Canada deems sufficiently damaged by the Contractor to question the plant capacity to survive, must be replaced by the Contractor, at the rate of 2 equivalent plantations for every damaged plant identified by Parks Canada.
- .2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Minimize stripping of topsoil and vegetation.
- .4 The Contractor must remove and stockpile crop canopy for reuse before works.
- .5 Restrict tree removal to areas indicated or designated by Representative of Parks Canada.
- .6 The Contractor shall obtain the approval of the Representative of Parks Canada for pruning. It must apply a product approved by the Representative of Parks Canada on the wound caused by selective branches cutting.
- .7 When plantations should be moved using a transplantation bucket, the Contractor must wrap them in a burlap bag with enough soil to contain all the roots and provide them with adequate protection. Hold the damp earth at any time. Keep away from the Sun. Replanting once the work completed at origin point or at the place indicated by the Representative of Parks Canada.

1.7 WORK ADJACENT TO WATERWAYS

- .1 It is forbidden to extract any natural or artificial material from or nor the watercourse bed.
- .2 Do not dump excavated fill, waste material or debris in waterways.
- .3 The Contractor sets up all necessary means (hay in bag, filter fence etc) to eliminate any discharge from sediments in the brooks.
- .4 The contractor shall determine the type of cofferdam or temporary works and method of construction and demolition, according to the characteristics of the soils encountered and watercourse to avoid environmental pollution. The design of temporary structures (cofferdams, dikes, etc.) shall consider a flooding event of two years and an additional protection of at least 300 mm.

- .5 Cofferdams materials must be clean and free from fine materials. Cofferdams constructed using fine materials are not allowed, even if they are contained in a geotextile
- .6 If the construction site is isolated by cofferdams and pumping is necessary, water must be directed into a sedimentation basin (Appendix 1) or a vegetated area. The water must be pumped out of the watercourse.
 - .1 The sedimentation basin must be designed according to the inflow and discharge,
 - .2 The sedimentation basin must be built outside the shoreline of the watercourse,
 - .3 The sedimentation basin must be cleaned when filled to 50%,
 - .4 The place used for cofferdam must be left in condition at least equivalent to the existing,
 - .5 The natural filter must be located in a grass field, in a bog or a forest litter and distance must be sufficient so that the water that returns to the watercourse does not create a sediment plume.
- .7 The pumps must be fitted to prevent the fish from getting into the pumping system.
- .8 Traffic is forbidden in watercourse. Design and construct temporary crossings to minimize erosion to waterways.
- .9 Do not skid logs or construction materials across waterways.
- .10 Work are not allowed in recognized watercourse as fish habitat between September 16 and May 31 inclusive.
- .11 Do not blast under water or within 500 m of indicated spawning beds.
- .12 Watercourse recognized as a fish habitat can not be blocked for more than 10 consecutive days.

1.8 ATMOSPHERIC POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment, vehicles and facilities in conformity with local, federal, provincial and municipal authorities' emission requirements.
- .3 The shot in 'slow motion' vehicles is prohibited, unless special authorization of the Representative of Parks Canada.
- .4 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area, by providing temporary enclosures.

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

1.9 WATER AND SOIL POLLUTION PREVENTION

- .1 The Contractor and subcontractors who perform work requiring the use of motorized equipment, fuel transfer or using hazardous products, must know and implement procedures to be followed in case of spills. This procedure should be displayed at the sight of employees at the work site.
- .2 The Contractor shall ensure that machinery, tooling, and equipment that will be used for the execution of the work, are safe, clean and in good working condition. The Representative of Parks Canada reserves the right to deny access or to expel the construction machinery, tooling and equipment that do not meet these requirements. Visibly badly maintained equipment and presenting evidence of leaks or the risk of leaks will be returned at the expense of the Contractor or the owner of the equipment, without charge to Parks Canada. Furthermore, the machinery allowed to traffic or work at less than 30 m from a watercourse, must use biodegradable vegetable oil.
- .3 If the Contractor must store hazardous materials and hydrocarbons, for the purposes of the project, there will be on-site retention tanks storage.
- .4 General maintenance, refueling and cleaning of equipment must be done at more than 30 m from the watercourse..
- .5 The Contractor shall have on site an emergency kit in order to respond to events requiring environmental emergency.
- .6 Without limitation, this kit of intervention must include and gather a minimum of equipment and devices to contain any spills to minimize the risk of contamination spreading caused by an oil spill, hazardous products or other contaminants. This intervention package identified EMERGENCY - ENVIRONMENT must contain:
 - .1 An absorbent bead of 3 inches in diameter, length of 12 feet;
 - .2 An absorbent bead of 3 inches in diameter, length of 4 feet;
 - .3 Twenty-five layers of absorbent;
 - .4 Two bags of 7 litres absorbent (Sphagnum moss Type);
 - .5 An epoxy stick.
 - .6 Two DANGER warning posters;
 - .7 Three recovery plastic bags;
 - .8 Stickers TDG (transport of dangerous goods) class 4.1;
 - .9 A indelible marker;
 - .10 Two pairs of rubber gloves;
 - .11 Two pairs of protective eyewear;

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- .12 Tape type 'Duct Tape';
- .13 A few tools: pliers and screwdrivers;
- .14 Declaration forms "Environmental incident report" from the garrison, provided by the Representative of Parks Canada.
- .7 Intercept runoff from off-site construction and maintain the waters off site by routing them to facilities or stabilized areas.
- .8 Drain off from the construction site runoff by sending to the approved facilities that promote sedimentation before they reach a water body.
- .9 Provide temporary protection to prevent soil loss caused by rain and snow melt.
- .10 Provide plans based on to the head of drainage, soil stability and development of the site.
- .11 The sediment barriers (straw bales or silt fences) are installed to keep the sediment within the boundaries of the site and avoid that sediments reach the water body.
 - .1 The filter straw bale is constructed using straw bales tightly assembled and anchored in a trench (Appendix 2). The trench for receiving straw bales must be dug at the base of a slope following the contours so that the barrier intercepts the runoff. The bales must be carefully stuck in the trench so that they are properly nested in it,
 - .2 The silt fence consists of geotextile, for this purpose, supported by wooden posts (Appendix 3). At base, the geotextile is well embedded in the ground to ensure efficiency,
 - .3 The sediment trap and filter berm are generally matched and installed in a ditch (Appendix 4). The hatch is a cavity carved into the ditch to slow the flow and allow sediment deposition. The berm is a temporary gravel ridge or crushed stone which dissipates the energy of the water flowing in the ditch. When the sediment trap is 50% filled, it must be emptied and, where necessary, the filter must be cleaned or replaced.
- .12 Temporary facilities in damp environment are prohibited. In addition, soil conditions and drainage must be maintained.
- .13 Limit the areas to be stripped in order to avoid erosion. At the end of each working day, the Contractor shall protect with membranes or sediment fences, any exposed surface vulnerable to erosion and may produce sediment to a water body or to a ditch discharging into a hydric environment.

1.10 PROCEDURES IN CASE OF SPILL, HAZARDOUS MATERIALS OR OTHER CONTAMINANT

- .1 In the event of a spill, the intervention and cleaning operations of the spill must be carried out by the Contractor in accordance with the following procedure:

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- .1 Ensure the safety of people and immediately retrieve the spill.
- .2 If the Contractor is unable to contain or to immediately recover the spill or spill occurs in water, it should notify, depending on the affected area:
 - .1 Local fire (9-1-1) Service
- .3 The Contractor must immediately report the spill (whatever the amount) to the Representative of Parks Canada as well as to the environment officer and prepare and submit to the Representative of Parks Canada, the intervention report provided by the Representative of Parks Canada.
- .4 The Contractor liable for any spill of product deemed harmful to the environment or property of Parks Canada, and if applicable, the Contractor shall execute immediately, at its expense, the corrective measures prescribed by the Representative of Parks Canada or environment officer.
- .5 Failing to intervene adequately and to the satisfaction of Parks Canada because of the size or the type of spill, the cost of complementary interventions that require staff or machinery of Parks Canada, will be brought to the responsibility of Contractor.
- .6 Intervention report: in case of intervention the Contractor shall complete without delay the event declaration (environmental incident report, provided by Representative of Parks Canada), and submit it to the Representative of Parks Canada.
- .7 This document will be presented at the preliminary meeting before the start of the work.

1.11 HAZARDOUS PRODUCTS TEMPORARY STORAGE

- .1 Hazardous products must be collected into blocks separated by a horizontal distance of 1 m. Incompatible products must be separated by a horizontal distance of 3 m. The blocks shall be located at least 30 m from a trees/shrubs lines and at least 6 m from a grass/herbaceous covered surface.
- .2 Safety distances must be observed (30 m from watercourses, 15 m of tents and 3 m of fuel equipment and roads. Access must be provided to emergency responders.
- .3 Portable tanks must meet road standards. During the transfer of fuel, fuel tank must be grounded. The vehicle being refuelled or tank must be connected to the tank truck, cable grounding, in ensuring that contact is established on bare metal.
- .4 Storage areas are equipped with a system of retention or capture of liquids (Polyspill pallets, Bowl, waterproof coatings, donkey, trenches, drains blocked or connected to a recovery system). Rainwater is drained regularly or the storage area is protected to avoid the accumulation of rainwater.
- .5 Containers for flammable and combustible liquids must be stored in an upright position.

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- .6 Containers in poor condition, should be immediately disposed outside the Parks Canada territory, in accordance with the most stringent environmental standards. Containers should be identified according to WHMIS.
- .7 The dangerous materials temporary storage must indicate risks with the TDG (transport of dangerous goods) placard-boards.

1.12 NON-COMPLIANCE NOTICE

- .1 A non-compliance notice will be issued in writing to the Contractor by the Representative of Parks Canada whenever Contractor doesn't comply with a law, a regulation or a provincial or municipal permit, or any other item of the Environmental Plan protection implemented by the Contractor.
- .2 Upon receipt of a notice of non-compliance, the Contractor shall propose corrective measures to the Representative of Parks Canada, who approves or not the Contractor proposal.
- .3 The Contractor shall obtain the written approval of the Representative of Parks Canada prior to the implementation of the proposed measures.
- .4 The Representative of Parks Canada order cessation of work until satisfactory corrective action.
- .5 No extra time and no adjustment will be accorded to the work stoppage.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

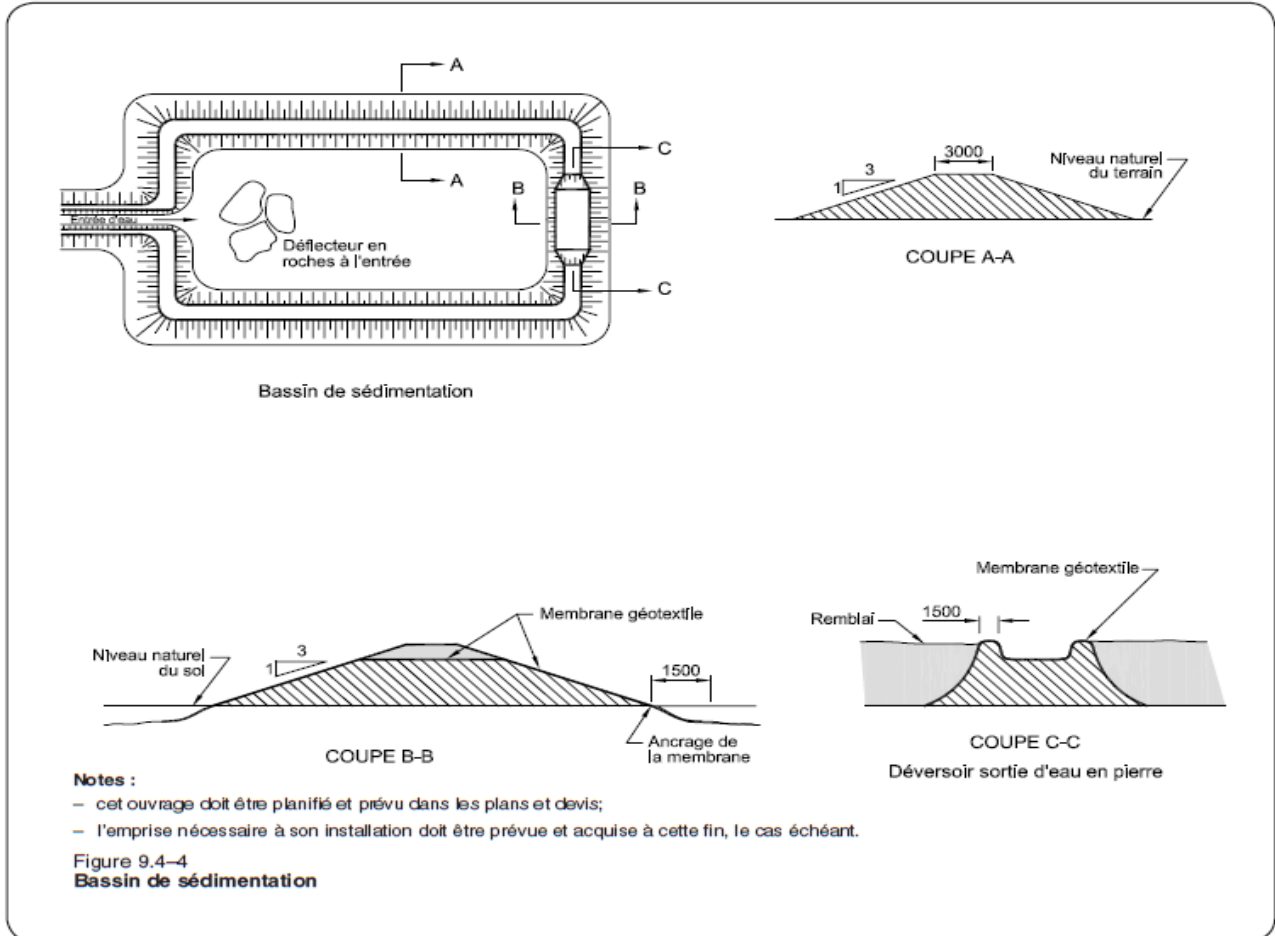
- .1 Not used.

END OF SECTION

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Appendix 1

Sedimentation Basin



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Appendix 2

Filter straw bale

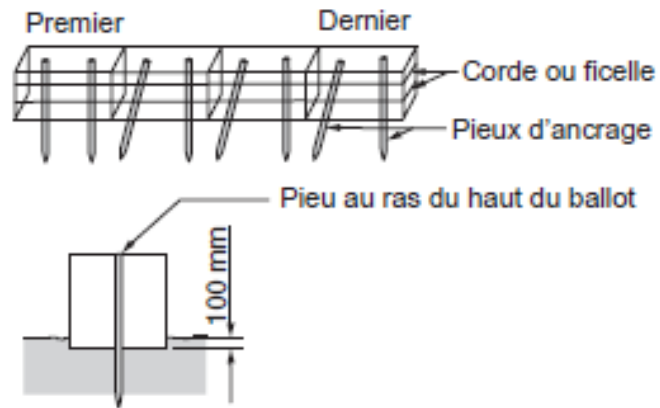
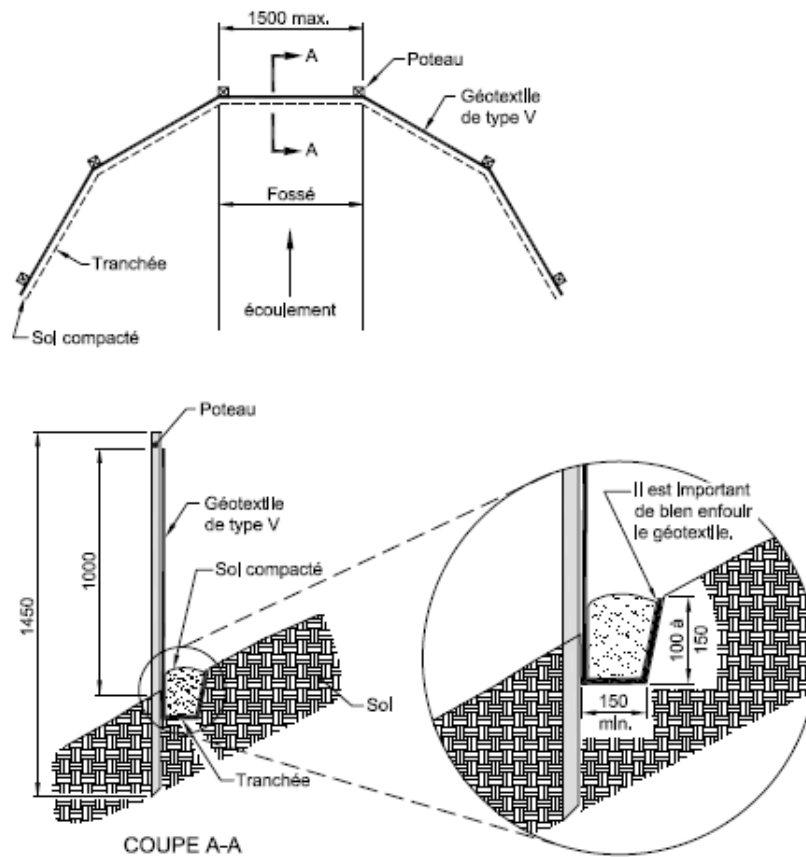


Figure 9.4-1
**Exemple d'ancrage de ballots de paille pour
disposition en série**

Appendix 3

Barrier with geotextile



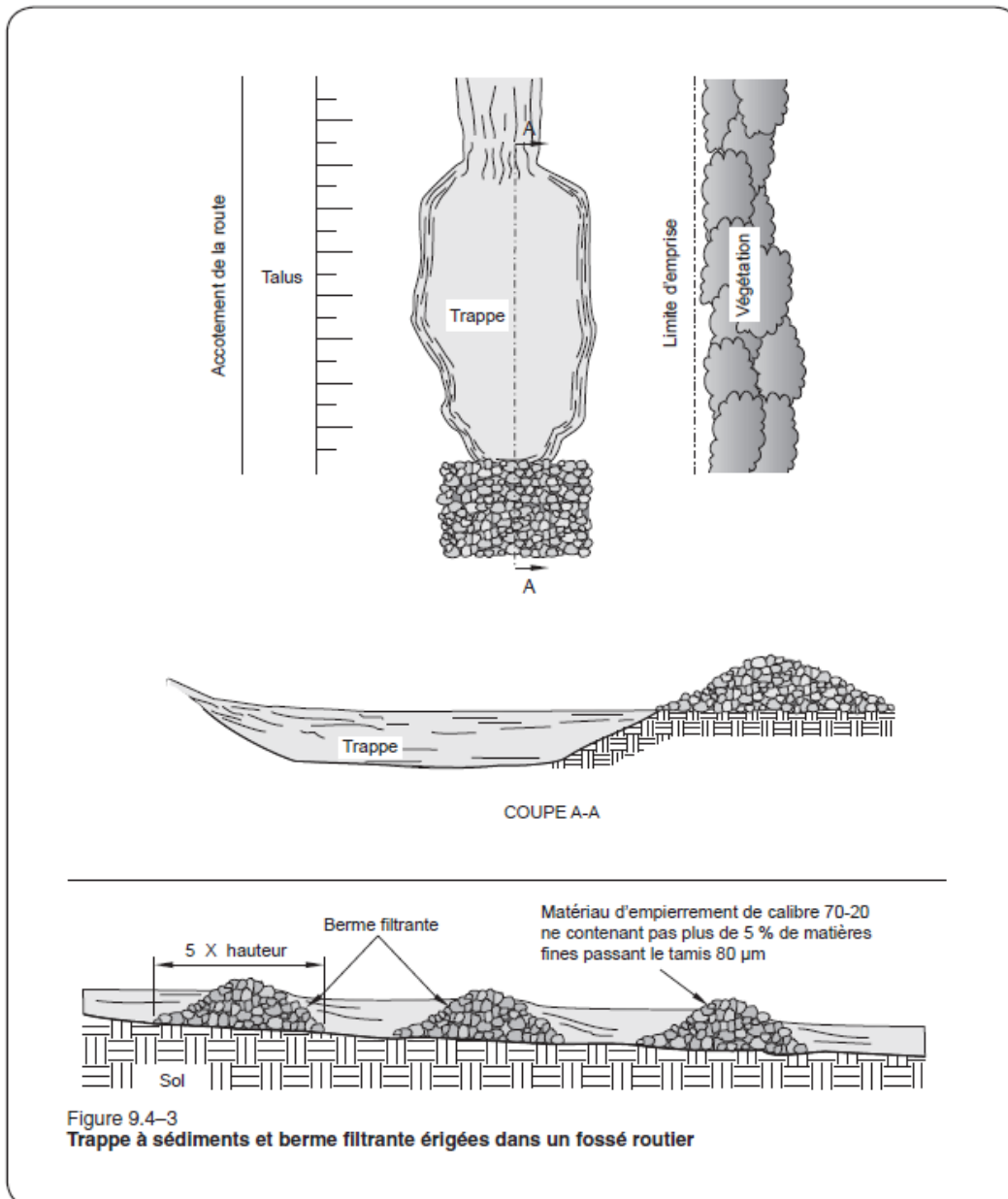
Note :

- les cotes sont en millimètres.

Figure 9.4-2
Installation d'une barrière munie d'un géotextile

Appendix 4

Sediments trap et filter berm



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Part 1 General

1.1 SECTION CONTENTS

- .1 Construction assistance.
- .2 Trailer Offices and locker.

1.2 INSTALLATION AND REMOVAL OF MATERIALS

- .1 Provide, set up or arrange the building site installations necessary for completion of work as soon as possible.
- .2 Dismount the material and dispose of it off site when no more needed.

1.3 ON SITE STORAGE/ELIGIBLE LOADS

- .1 Make sure that work is carried out within the limits indicated in the contractual documents. Do not glut the site with materials in an unreasonable way.
- .2 Do not to overload nor allow overloading any part of work in order to not compromise its integrity.

1.4 ON SITE PARKING

- .1 It will be allowed to park on the building site in the condition not to block carrying out of the work.
- .2 Arrange suitable roads to access to the building site and ensure its maintenance.
- .3 Arrange temporary access roads on places indicated or specified by the Representative of Parks Canada and ensure its maintenance.
- .4 If it is allowed to use the existing roads to reach the building site, ensure their maintenance for all duration of the work and, if necessary, repair any damage.

1.5 TRAILER OFFICES

- .1 Prepare a ventilated office, heated at a temperature of 22 °C, equipped with lighting ensuring a level of illumination of 750 lux and big enough to allow meetings, and prepare a table for the drawings. Also, the trailer must be supplied with electricity 115/230 volts.
- .2 Provide clearly identify a complete first aid kit, and place it at an easy to reach place.

- .3 If needed, the subcontractors must arrange their own office. Indicate them where they can install themselves.
- .4 Trailer Office of the Representative of Parks Canada.
 - .1 Arrange a temporary office for the Departmental Representative.
 - .2 The office must measure, interior wise, at least 5,0 m length X 3,0 m width X 2,4 m height with an adjacent office of at least 3,6 m length equally wide and the same height and with a floor located at 0,3 m above the ground, with also like 4 windows opening 50 % and a lockable door and provide electricity 115/230 volts.
 - .3 The office must be well insulated and be equipped with a heating system and air-conditioning ensuring a room temperature of 22 °C when the outside temperature is -20 °C.
 - .4 The walls and the ceiling must be covered with plywood panels, hard fiberboards or plasterboards, then painted according to the selected colors. The floor must be covered with plywood panels of 19 mm thickness.
 - .5 The office must be equipped with an electric lighting system ensuring a level of illumination of 750 lux; the apparatuses used must be of commercial type, with direct lighting with (10 % of the light upward directed), wall-mounted luminaries, provided with reflectors.
 - .6 Furnish the office with a table of 1 m X 2 m, a table of 1,2 m X 2,4 m, 12 chairs, an office chair with casters, of a dustbin, a cool water distributor, shelves of 300 mm width, adding up to 6 m length, a sorter with three drawers, a drawings support and a clothing support with shelf.
 - .7 Keep the places clean.

1.6 STORAGE OF THE MATERIALS AND TOOLS

- .1 Provide weatherproof lockers intended for materials and tools storage, and keep the lockers clean and in order.
- .2 Leave on site materials which do not have to be kept with the shelter, but make sure they don't obstruct any work.

1.7 SANITARY FACILITIES

- .1 Budget sanitary facilities for the workmen in accordance with the ordinances and with the relevant bylaws.
- .2 Post necessary advices and take all local health authorities required precautions. Keep the places and the sector clean.

1.8 TRAILER OFFICES ELECTRICIY

- .1 The Contractor will be able to connect and disconnected, at his own expenses, the two trailer offices on the existing electricity network and will not have to defray the costs of energy consumption.
- .2 The Contractor must provide and install all required material for the connection.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submit to the Representative of Parks Canada copies of the following documents, including updates issued:
 - .1 Health and Safety Program as indicated in paragraph 1.9, prior to commencement of work on the work site.
 - .2 Reports or directions issued by authorities having jurisdiction, immediately upon issuance from that authority.
 - .3 Accident or Incident Reports, within 24 hrs of occurrence.
- .2 Submit other data, information and documentation upon request by the Representative of Parks Canada as stipulated elsewhere in this section.

1.2 COMPLIANCE REQUIREMENTS

- .1 Comply with the latest edition of the Quebec Occupational Health and Safety Act, and the Regulations made pursuant to the Act.
- .2 Observe and enforce construction safety measures required by:
 - .1 Ministère des Transports - Quebec Safety Code – Volume V – Traffic Control Devices
 - .2 Highway Safety Code.
 - .3 Provincial Worker's Compensation Board.
 - .4 Municipal statutes and ordinances.
- .3 In event of conflict between any provisions of above authorities the most stringent provision shall apply.
- .4 Provide and maintain Worker's Compensation Board coverage for all employees for the duration of the contract. Prior to commencement of the work, at the time of Interim Completion and prior to final payment, provide to the Representative of Parks Canada a letter [certificate] of Clearance from the Workers' Compensation Board indicating that the Contractor's account is in good standing.
 - .1 Should the Contractor be a sole proprietor, provide documented proof in a form acceptable to the Representative of Parks Canada, of an alternative means of personal coverage that meets or exceeds the requirements set out above for Worker's Compensation Board coverage.

1.3 RESPONSIBILITY

- .1 The Contractor is responsible for safety of persons and property on the work site and for protection of federal employees and the general public circulating adjacent to work site operations to extent that they may be affected by conduct of work.
- .2 The Contractor is to enforce compliance by workers and other persons granted access to work site with safety requirements of Contract Documents, applicable federal, provincial, and local statues, regulations, and ordinances, and with the Contractor's Health and Safety Program.
- .3 Should an unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise the Representative of Parks Canada verbally and in writing of the hazard or condition.

1.4 SITE CONTROL AND ACCESS

- .1 Control all work site access points and work site activities. Delineate and isolate the work site from adjacent and surrounding areas by use of appropriate means to maintain control of all work site access points.
- .2 Make provisions for granting permission to access onto work site to all persons who require access. Procedures for granting permission to access are to be in accordance with the Quebec Occupational Health and Safety Act, and the Regulations made pursuant to the Act and the Contractor's Health and Safety Program.
- .3 Ensure persons granted access to the work site are in possession of and wear the minimum personal protective equipment (PPE) designated by the Contractor's Health and Safety Program. Ensure persons granted access to the work site are provided with, trained in the use of, and wear, appropriate PPE that are required above and beyond the designated minimums previously noted and as specifically related to the work site activity that they are involved in. Be responsible for the efficacy of the PPE that is provided above and beyond the designated minimums.
- .4 Erect signage at access points and at other strategic locations around the work site clearly identifying the work site area(s) as being "off-limits" to non-authorized persons. Signage must be professionally made with well understood graphic symbols and is not to be used as advertising but for the specific use as related to site safety and key contact information.
 - .1 Information to be provided on the signage is as follows:
 - .1 Project Name/Description:
 - .2 Contractor Company Name:
 - .3 Project Superintendent's Name/Phone No.:

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- .5 Secure the work site at all times to protect against un-authorized access.

1.5 FILING OF NOTICE

- .1 File Notice of Project and any other required Notices with the Provincial/Territorial Authorities prior to commencement of the work. Provide the Representative of Parks Canada with a copy of the filed Notice(s) prior to commencement of the work.

1.6 PERMITS

- .1 Obtain permits, licenses and compliance certificates at appropriate times and frequencies as required by the authorities having jurisdiction.
- .2 Post all permits, licenses and compliance certificates on work site and provide copies to the Representative of Parks Canada.

1.7 PROJECT/SITE CONDITIONS

- .1 The following are the known hazardous substances and/or hazardous conditions at the work site which shall be considered as health or environmental hazards and shall be properly managed should they be encountered as part of the work:
 - .1 Contractors are required to be aware of the known hazardous substances and/or hazardous conditions and are to include in their tender price all work associated in working with, in and around the hazards.
 - .2 The above lists shall not be construed as being complete and inclusive of all safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.8 MEETINGS

- .1 Prior to commencement of work attend a pre-commencement meeting conducted by the Representative of Parks Canada. Ensure minimum attendance by contractor's site superintendent. The Representative of Parks Canada will advise of time, date and location of the meeting and will be responsible for recording and distributing the minutes.
- .2 Conduct site specific occupational health and safety meetings as required by the Québec Occupational Health and Safety Act, and the Regulations made pursuant to the Act.
- .3 Record and post minutes of all meetings in plain view on the work site. Make copies available to the Representative of Parks Canada upon request.

1.9 HEALTH AND SAFETY PROGRAM

- .1 Contractors are required under Québec Occupational Health and Safety Act, and the Regulations made pursuant to the Act to have in place a Health and Safety Program. Compliance requirements for the content, detail and implementation of the program resides with the provincial/territorial authority. For the purpose of this contract the Health and Safety Program shall include a site-specific Health and Safety Plan that acknowledges, assesses and addresses the hazardous substances and/or hazardous conditions known and identified in paragraph 1.7 above, and on-going hazard assessments performed during the progress of work identifying and documenting new or potential health risks and safety hazards not previously known and identified.
- .2 Provide one copy of the Health and Safety Program to the Representative of Parks Canada prior to commencement of work on the work site. The copy provided to the Representative of Parks Canada is for the purpose of review against the contract requirements related to the known hazardous substances and/or hazardous conditions. The review is not to be construed to imply approval by the Representative of Parks Canada that the program is complete, accurate and legislatively compliant with the Québec Occupational Health and Safety Act, and the Regulations made pursuant to the Act, and shall not relieve the Contractor of their legal obligations under such legislation.

1.10 ACCIDENT REPORTING

- .1 Investigate and report incidents and accidents as required by Quebec Occupational Safety and Health Act, and the Regulations made pursuant to the Act.
- .2 For the purpose of this contract immediately investigate and provide a report to the Representative of Parks Canada on incidents and accidents that involve:
 - .1 A resulting injury that may or may not require medical aid but involves lost time at work by the injured person(s).
 - .2 Exposure to toxic chemicals or substances.
 - .3 Property damage.
 - .4 Interruption to adjacent and/or integral infrastructure operations with potential loss implications.
- .3 In the investigation and reporting of incidents and accidents, the Contractor is required to respond in a timely fashion to correct the action that was deemed to have caused the incident and/or accident and advise in writing on the action taken to prevent a re-occurrence of the incident and/or accident.

1.11 RECORDS ON SITE

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

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- .2 Upon request, make copies available to the Representative of Parks Canada.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Representative of Parks Canada. Do not burn waste materials on site, unless approved by Representative of Parks Canada.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling.
- .6 Dispose of waste materials and debris off site.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

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 products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Representative of Parks Canada. Do not burn waste materials on site, unless approved by Representative of Parks Canada.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

Part 2 **Products**

2.1 **NOT USED**
 .1 Not used.

Part 3 **Execution**

3.1 **NOT USED**
 .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTION

.1 Submittal Procedure Section 01 33 00

1.2 SECTION CONTENTS

- .1 Project file, samples and specifications;
- .2 Shop drawings;
- .3 Annotated plans, consistent with execution;
- .4 Technical sheets, materials, equipment and finishing products, and related information;
- .5 Materials/equipment replacement, special tools and spare parts;
- .6 Guarantees and suretyships of site Parks Canada Agency.

1.3 SUBMITTALS

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Representative of Parks Canada comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to Representative of Parks Canada two final copies of operating and maintenance manuals in English and French.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 Furnish evidence, if requested, for type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

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- .9 The Contractor supplies all documents to be submitted at the end of works in PDF file format.

1.4 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. 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 process flow, 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. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide CAD files on scale 1:1 on dwg format on CD.

1.5 CONTENTS – EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names, addresses, and telephone numbers of the Representative of Parks Canada and Contractor with name of responsible parties.
 - .2 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.

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- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.6 AS BUILT AND SAMPLES

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

1.7 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual.
- .2 Provide felt tip marking pens, maintaining separate colors for each major system, for recording information. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 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 Drawings.
 - .4 References to related shop drawings and modifications.

1.8 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

- .2 Remove damaged or destroyed products and replace them at no additional cost to the satisfaction of the Representative of Parks Canada.

1.9 WARRANTIES

- .1 The warranty shall be worded as follows: Parks Canada Agency.
- .2 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing. All warranties should be found in the operation and maintenance manual. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Except for items put into use with Representative of Parks Canada permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined
- .4 Make sure that the documents are in good and due form, they contain all the necessary information

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Safety Requirements Section 01 70 12
- .2 Hazardous Materials Section 02 81 01

1.2 REFERENCES

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
 - .1 Export and Import of Hazardous Waste Regulations (SOR/2002-300).
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Code of Canada 2005.
- .4 Transportation of Dangerous Goods Act (TDG Act) 1999, (c. 34).
- .5 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2003-400).

1.3 DEFINITIONS

- .1 Dangerous Goods: product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .3 Hazardous Waste: any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .4 Workplace Hazardous Materials Information System (WHMIS): Canada-wide system designed to give employers and workers information about hazardous materials used in workplace. Under WHMIS, information on hazardous materials is provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

1.4 SUBMITTALS

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

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- .2 Product Data:
 - .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit to Representative of Parks Canada current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on site.
 - .2 Submit hazardous materials management plan to Representative of Parks Canada that identifies hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Co-ordinate storage of hazardous materials with Representative of Parks Canada and abide by internal requirements for labelling and storage of materials and wastes.
- .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.
- .4 Keep no more than 45 L of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 L for work purposes requires the written approval of the Representative of Parks Canada.
- .5 Do not transfer of flammable and combustible liquids in vicinity of open flames or heat-producing devices.
- .6 Do not use flammable liquids having flash point below 38 °C, such as naphtha or gasoline as solvents or cleaning agents.
- .7 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
- .8 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
- .9 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 L for liquids:

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- .1 Store hazardous materials and wastes in closed and sealed containers.
- .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
- .3 Store hazardous materials and wastes in containers compatible with that material or waste.
- .4 Segregate incompatible materials and wastes.
- .5 Ensure that different hazardous materials or hazardous wastes are not mixed.
- .6 Store hazardous materials and wastes in secure storage area with controlled access.
- .7 Maintain clear egress from storage area.
- .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
- .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
- .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
- .10 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .11 Report spills or accidents immediately to Representative of Parks Canada. Submit a written spill report to Representative of Parks Canada within 24 hours of incident.

1.6 TRANSPORTATION

- .1 Transport hazardous materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .2 If exporting hazardous waste to another country, ensure compliance with federal Export and Import of Hazardous Waste Regulations.
- .3 If hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Representative of Parks Canada.
 - .2 Ensure compliance with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Prior to shipping material obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.

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- .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
- .6 Ensure that trained personnel handle, offer for transport, or transport dangerous goods.
- .7 Provide photocopy of shipping documents and waste manifests to Representative of Parks Canada.
- .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to Representative of Parks Canada.
- .9 Report discharge, emission, or escape of hazardous materials immediately to Representative of Parks Canada and appropriate provincial authority. Take reasonable measures to control release.

Part 2 Products

2.1 MATERIALS

- .1 Only bring on site quantity of hazardous materials required to perform work.
- .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

Part 3 Execution

3.1 DISPOSAL

- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
- .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
- .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

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- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.
 - .3 Lead-acid battery recycling.
 - .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

- .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.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .3 Shop drawings.
 - .1 Submit drawings stamped and signed by qualified professional engineer registered or licensed in Canada and in province of Quebec..
- .4 Certificates: certified weigh bills receipts from authorized disposal sites and reuse and recycling facilities for material removed from site.
 - .1 Written authorization from Departmental Representative is required to deviate from haulers, facilities or receiving organizations listed in Waste Reduction Workplan.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEEA, TDGA, and applicable Provincial/Territorial regulations.
- .2 Health and Safety.
 - .1 Do construction occupational health and safety.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Perform Work in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Store and manage hazardous materials in accordance with Section 02 81 01 - Hazardous materials.
- .3 Storage and Protection.
 - .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Representative of Parks Canada and at no cost to Representative of Parks Canada.
 - .2 Remove and store materials to be salvaged, in manner to prevent damage.
 - .3 Store and protect in accordance with requirements for maximum preservation of material.
 - .4 Handle salvaged materials as new materials.

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- .4 Waste Management and Disposal.
 - .1 Divert excess materials from landfill to site approved by Representative of Parks Canada.
 - .2 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.
 - .3 Place materials defined as hazardous or toxic in designated containers.
 - .4 Handle and dispose of hazardous materials in accordance with CEPA, Regional and Municipal regulations.
 - .5 Label location of salvaged material's storage areas and provide barriers and security devices.
 - .6 Ensure emptied containers are sealed and stored safely.
 - .7 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, concrete and asphalt, and gypsum.
 - .8 Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

1.8 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Do not dispose of waste of 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 the project.
 - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
 - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
 - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .2 Existing Conditions.
 - .1 Remove contaminated or hazardous materials from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements.

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1.9 SCHEDULING

- .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
- .1 Notify Representative of Parks Canada in writing when unforeseen delays occur.

Part 2 Products

2.1 EQUIPMENT

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

Part 3 Execution

3.1 PREPARATION

- .1 Inspect site with Representative of Parks Canada and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

3.2 REMOVAL OF HAZARDOUS WASTES

- .1 Remove contaminated or dangerous materials 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.

3.3 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Removal of Pavements:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Representative of Parks Canada.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials to working area.

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- .4 Foresee the storage of materials for reuse in sub-base mixed with the granular layer of the foundation in place.
- .4 Removal of the base and sub-base
 - .1 300mm above the existing foundation will be collected to create a recycled material that can be used in sub-base. This re-use must meet the requirements of the plans and specifications. The method recommended by the contractor shall be submitted to the Representative of Parks Canada for approbation. The contractor shall provide, at his expense, granulometric analyzes demonstrating that the materials meet the requirements.
- .5 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,
- .6 Excavate at least 300mm below pipe invert, when removing pipes under existing or future pavement area.
- .7 Fences removal
 - .1 Remove and dispose fences approved landfill
- .8 Remove concrete wall
 - .1 Removal includes reinforcement and foundation
 - .2 Debris disposal
 - .3 Backfill the excavation
- .9 Remove designated trees during demolition
 - .1 Obtain written approval of the Representative of Parks Canada prior to removal of trees not designated
- .10 Disposed of alternately trees designated for removal
 - .1 Grind, chip, or shred other vegetation for mulching and composting, or use as process fuel
- .11 Stockpile topsoil for final grading and landscaping.
 - .1 Provide erosion control and seeding if not immediately used
- .12 Salvage
 - .1 Dismantle items containing materials for salvage and stockpile salvaged materials
- .13 Disposal of Material
 - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan

- .14 Backfill.
 - .1 Backfill in areas as indicated and in accordance with Section 31 23 11. – Excavation and Backfilling

3.4 STOCKPILING

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 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.

3.5 REMOVAL FROM SITE

- .1 Remove stockpiled material as directed by the Representative of Parks Canada, when it interferes with operations of project.

3.6 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.

3.7 CLEANING

- .1 Remove debris, trim surfaces and leave work site clean, upon completion of Work
- .2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

END OF SECTION

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Part 1 General

1.1 GENERAL CONDITIONS

- .1 The Contractor is required to comply with all clauses contained this section of the specifications complementing all those contained in other documents, which are an integral part of the tender.

1.2 REFERENCE DOCUMENTS

- .1 Bureau de normalisation du Québec (B.N.Q.).
 - .1 BNQ 1809-300 (latest edition) : Construction Work - General Technical Clauses - Drinking Water and Sewer Pipes.
- .2 Ministry for Transports Quebec:
 - .1 Cahier des charges et devis généraux of the Ministry for Transport of Quebec, latest edition.
 - .2 Road Works, Standards of the Ministry for Transport of Quebec, latest edition.

1.3 PAYMENT

- .1 For the entire project, the methods of payment are described in the project administrative clauses and in the various sections of the technical specifications. The project administrative clauses have precedence over the lump sum descriptions enumerated below. These descriptions are supplemental to the administrative clauses.
- .2 Each culvert is independently paid as lump sum
- .3 The payment of the lump sum amount indicated in the Contractor's tender constitutes a complete compensation for the supply of materials, equipment, accessories, machinery, tools and labor which are necessary to complete work.
- .4 The lump sum amount includes mass or trenched excavation, when such work is required, stripping of topsoil and humus and stockpile for later use, removal of shrubs, undergrowth, refuse, etc, hand or machine digging, removal and disposal of boulders on road embankments, pumping and bracing as required, removal of existing culverts, specific environmental actions, works on watercourse, supply and installation reinforced concrete culverts and precast reinforced concrete headwalls, backfilling and compaction, transportation, disposal and, if necessary, spreading of unacceptable or non-reusable materials (loading, transportation and disposal fees) in or out of the work site, support of services and existing structures, ditches diversion, culverts, sewers and drains, etc.

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- .5 It also includes pipe and head walls bedding and surround material as well as granular materials to backfill trenches, when such work is required, including supply, transportation, installation and compaction of these materials, in conformity with the requirements of the "Tender Documents" and finally loading, transportation and disposal of surplus excavation material in a site approved by the MDDEFP. It also includes, riprap protection with geotextile, supply and installation of granular bases and pavement.
- .6 It includes all related procedures and fees to obtain all required permits from the concerned authorities (Municipality, MTQ (intervention permit)) to complete work like: cutting, service connection, fire hydrant use, temporary use of public road permit, etc.
- .7 It includes the Contractor's profits, his administrative expenses, the insurance premiums, the building site installation expenses.
- .8 Finally, it includes transportation and disposal of waste materials, protection of existing services, legal and/or geodetic bench marks, existing installations to be preserved, temporary service roads and road signs, dust control agent, grading, cleaning and any necessary work for completion according to good engineering practice.

1.4 BITUMEN PRICE

- .1 Notwithstanding the clauses concerning the adjustment of the bitumen price of the CCDG (latest edition), the unit price of the supply and poses of paving is applied.

1.5 ALLOCATED AMOUNT FOR CONTINGENCIES

- .1 The amount entered for the item "Contingencies" of the price schedule constitutes a provision for the execution of unforeseen work and does not constitute a promise of payment partly or totally towards the Contractor.
- .2 Any payment carried out under the terms of this item must correspond to work having been recognized as being additional work unforeseen in this mandate and approved by the Representative of Parks Canada..

1.6 DEFINITIONS

- .1 Where the following words and terms are met in these estimates, they have the following significance, unless the context implies a different significance, namely:
 - .1 Representative of Parks Canada: Physical or moral person who, by his technical skill, is elected by the Owner in order to supervise work, to control its quantities and quality and propose their reception and their payment;

- .2 Laboratory: Physical or moral person who, by his technical skill, is elected by the Owner to carry out qualitative tests on materials and to control their installation;
- .3 Contractor: Tenderer whose tender is accepted by the Owner, his representatives, its successors or having right as contracting party with the Owner and who have the responsibility for the execution of the whole of work;
- .4 Owner: Corporation or City asking the tenders and giving a contract for the completion of the specified work. In current contract the Owner is Parks Canada Agency.
- .5 Director: Responsible person for the contract directly concerned with the contract and called to represent the Owner in the execution of the contract, when required, or, in the absence of the director, one of his assistant;
- .6 Supervisor: Person who, by his technical skill, represents the Representative of Parks Canada on the building site in order to supervise work to control the quantities and quality;
- .7 Line of infrastructure: Level of ground or backfilling which must be prepared to receive granular materials;
- .8 Sewer: Sanitary, storm or unit sewerage systems;
- .9 Watermain: Pipe and accessories system intended to transport drinking water from one place to another;
- .10 AWWA: American Water Works Association;
- .11 ASTM: American Society for Testing and Materials;
- .12 CSA: Association Canadienne de Normalisation;
- .13 ASA: American Standards Association;
- .14 BNQ: Bureau de Normalisation du Québec;
- .15 ULC: Under-Writers' Laboratories of Canada;
- .16 FM: Factory Mutual;
- .17 P.M.: Density Test of Modified Proctor carried out according to standard CAN/BNQ 2501-255 « Sols - Détermination de la teneur en eau relative - masse volumique - Essai Proctor Modifié »;
- .18 AASTHO: American Association of State Highway and Transportation Officials;
- .19 CGSB: Canadian Government Board Specification;
- .20 ACLE: Association Canadienne des Laboratoires d'essai;
- .21 ONGC: Office des Normes du Gouvernement Canadien;
- .22 Aggregates: Mix Natural and/or manufactured mix from elements of various nature, dimension and forms;
- .23 Bitumen: Bituminous binding material, used hot in the preparation of the bituminous coating;
- .24 Slope: x : y (horizontal : vertical);

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- .25 MTQ XXXX: Ministry for Transport of Quebec Standard number XXXX, including the most recent revisions in the book of the general clauses;
 - .26 LC XX - XXX: Laboratoire des chaussées of the Ministry for Transport Quebec Standard number XX - XXX (latest edition);
 - .27 CCDG: Cahier des charges et devis généraux of the Ministry for Transport of Quebec, latest edition, including the book of the general clauses and the most recent addenda;
 - .28 CSA A23.1: Standard A23.1-94 « Béton - Constituants et exécution des travaux »;
 - .29 CSA A23.2: Standard CSA A23.2-94 « Essais concernant le béton »;
 - .30 ACNOR: Association Canadienne de Normalisation;
 - .31 NQ: Standard coming from the Bureau de Normalisation du Québec (BNQ).
- .2 Each time one of the definite terms is used in this present estimate to refer to a standard, it should be understood that the reference is made to the most recent revision of this standard.

1.7 GUARANTEE PERIOD

- .1 The guarantee period for the work as a whole is twenty four months after provisory acceptance.

1.8 ACCESS TO WORKSITES AND EMPLOYEE ACCESS

- .1 In his bid, the Contractor must include costs inherent in the construction and maintenance of temporary access roads required to carry out the work, in keeping with the site's access conditions.
- .2 In addition, at all times, the Contractor must ensure, to the Representative of Parks Canada satisfaction, that employees and riverfront residents, both pedestrians and motorists, have safe and adequate access. Furthermore, access to emergency vehicles (firefighters, police, and ambulance) must be ensured at all times.
- .3 Open traffic at all times during work at RP_02010 the culvert. The Contractor shall provide in its tender the costs associated with maintaining this track, road signs and support trenches required for the time of the work to this culvert.

1.9 SITE GUARDING

- .1 No site guarding services will be provided by the Owner. The Contractor shall be responsible for ensuring the security of his materials and equipment throughout the entire work period, until the project's provisional acceptance.
- .2 No damage claims will be accepted by the Owner.

1.10 MAINTENANCE, TRAFFIC AND WORK SIGNS

- .1 When street closings or traffic detours are required, the Contractor must submit a written request along with a plan showing the location of the trench and the projected detour route, to obtain, authorizations from all owner departments and/or municipal and provincial authorities concerned by this work, within 48 hours.
- .2 The Contractor must ensure adequate signage using barricades, flashing lights, flagmen, etc., during work, twenty-four (24) hours a day, to the satisfaction of the Representative of Parks Canada, and in compliance with the Department of Transportation's signage standards for short-term work.
- .3 The Contractor must, at his own expense, restore the site he has or must use, deteriorate, damage, disturb, circumvent or displace in order to carry out the work.
- .4 Should the Contractor fail to provide adequate signage, as required by the aforementioned documents, the Owner can, at any time and without prior notice, send in a work team to install the required sign systems or remain on site until the Contractor has provided adequate signage for the project, in which case any expenses incurred will be deducted from amounts owed to the Contractor.
- .5 All of this work shall be carried out to the satisfaction of the Representative of Parks Canada and at the Contractor's expense.
- .6 The Contractor must ensure that the worksite is dust-free and, if need be or at the request of the Representative of Parks Canada, must water the site. The Contractor will also be required to ensure the cleanliness of the streets used by the trucks. He must ensure that a water truck is available for watering at all times.
- .7 Should the Contractor fail to comply with this clause, the Representative of Parks Canada can, upon 24 hours' notice, have the cleaning and/or watering carried out by another Contractor and deduct the cost, progressively, from amounts committed.
- .8 The cost of watering and street cleaning using a mechanical sweeper shall be included in the bid since no specific remuneration will be allocated to these activities.
- .9 At all time, the Contractor must conform to the local by-laws and, mainly, the regulations on safety signalling to the accesses of temporary obstacles on the public highway.
- .10 In addition to satisfying the requirements of the estimate, The Contractor must submit, for approval, at least ten (10) business days before the beginning of work, any project of diversion of circulation to the director or his representative. All the plans of detour and lanes closures will have to conform to the standards of the road works (Volume V, Volume 1, Road signs of the MTQ). The required documents include:

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- .1 A summarized description of work to be realized;
- .2 A plan of localization of work;
- .3 A working schedule;
- .4 A plan of detour or circulation deviation drawn on a realistic scale as well as the associated dates;
- .5 A plan of signalling and temporary marking.

1.11 SUPERVISION OF THE WORK

- .1 All work by the Contractor must be carried out under the supervision of a Representative of Parks Canada inspector.
- .2 To this end, the Contractor is required to notify the Representative of Parks Canada and/or his representative at least twenty-four (24) hours prior to the start or resumption of the work.
- .3 Should the Contractor fail to notify the Representative of Parks Canada, said contractor will be required to prove, at his expense and to the full satisfaction of the Representative of Parks Canada that all work conducted in the absence of an inspector complies with plans and specifications.
- .4 The Owner reserves the right to have the Contractor restart, at the expense of said Contractor, work carried out without the supervision of the Representative of Parks Canada inspector.
- .5 Furthermore, following a second inspection of work deemed partly or wholly inadequate by the Departmental Representative, the Contractor shall be required to pay the supervision and inspection costs resulting from this repeated operation.
- .6 The Contractor must provide the civil supervisor with a trailer, a cellular telephone and water.
- .7 However, for the work carried out in the right of way of Hydro-Quebec, Bell Canada, Metropolitan Gas Inc., Trans-Northern Line Pipe, railroad companies or others, the monitoring of work is carried out jointly by the Representative of Parks Canada and the representatives of the organizations concerned and this, at the expenses of the Owner, unless contrary specifications.

1.12 MATERIALS

- .1 The Contractor shall be responsible for preserving all materials during their transportation, handling, and storage until the time of their use and must, at all times, take all required precautions to ensure minimum power consumption.

- .2 The Representative of Parks Canada will refuse all materials that are damaged and/or fail to comply with established standards in which case the Contractor will be required to transport them, at his expense, off the worksite.
- .3 Should the Contractor believe that he can, using an appropriate treatment, make defective materials acceptable, the Representative of Parks Canada may authorize the attempt. In the event of failure, however, the Contractor will be solely responsible for resulting losses.
- .4 Materials of different qualities and sources must be stored separately to allow a full and rapid inspection at any given time.
- .5 Neither materials to be stored nor the Contractor's materials are to be placed where they could present a hazard or interfere with traffic.
- .6 The Contractor must therefore obtain and outfit the land required for the safe and secure storage of materials and equipment.

1.13 PROPOSED ELEVATIONS

- .1 It should be noted that the Representative of Parks Canada reserves the right to modify any elevation proposed in the plans attached to this document. In fact, the Contractor will not be entitled to submit any claim for the modification of elevations of 150 mm or less. The Contractor will also be advised 48 hours in advance of said modifications.

1.14 AVAILABILITY OF THE WORKSITE

- .1 The Contractor must take the necessary measures during the work, to ensure that his equipment, materials and manpower remain on the property of Parks Canada.

1.15 VIDEO RECORDING

- .1 Prior to the start of the work, the Contractor must retain the services of a specialist to produce a quality video recording of the worksite and adjacent properties.
- .2 This recording must include a shot and description of all buildings, structures, trees, fences, the condition of the premises and any element likely to become the object of a damage claim.
- .3 No excavation work shall be authorized until two (2) DVD copies of the video recording have been given to the Representative of Parks Canada. The Contractor shall keep the original copy of the recording for his personal use. These costs must be included in the bid.

1.16 INCONVENIENCES TO EMPLOYEES

- .1 Throughout the work and at his own expense, the Contractor shall be required to notify parties concerned by the work at least 24 hours in advance that they will be unable to park in a given location, at contractor's expense.

1.17 EXCAVATION MATERIALS

- .1 The Contractor is required to reuse, first, excavation materials accepted by the Representative of Parks Canada as fill.
- .2 Work involving the loading, transportation and disposal of excavation surplus, which cannot be reused as backfill on the worksite will be at the Contractor's expense and must be carried out in compliance with the directives of the Soil Protection and Contaminated Sites Rehabilitation Policy of the MDDEFP (Ministry of Sustainable Development, Environment, Fauna and Parks).

1.18 GEOTECHNICAL ADVISE

- .1 Geotechnical advise for culvert RP_02010 and RP_45187 are attached to this document.

1.19 LOCATION OF EXISTING UTILITIES

- .1 The underground location of public utilities and services shown on the plans was determined further to a compilation of all available data. Before undertaking excavation work, the Contractor must notify the existing utility companies to obtain the most recent "as executed" plans of underground services, to identify the location on the site, of the various pipes such as: watermains, sewer mains, wire and cable ducts for lamp posts, Bell or other telecommunication cables, Hydro-Quebec, Gaz Metropolitan, TNPL, TQM, etc. The Contractor must obtain written confirmation of the location of utilities and provide the Representative of Parks Canada with a copy.
- .2 The Contractor must ensure that he is informed of the special clauses and conditions of the aforementioned companies with which he must comply in order to work in the vicinity of their infrastructures. The cost of complying with these restrictions as well as for obtaining required permits must be included in the bid.
- .3 The Contractor is responsible for undertaking all measures to locate and uncover these utilities and services as well as all damages to public utilities.

1.20 INFO-EXCAVATION

- .1 Prior to starting excavation work, the Contractor has both the responsibility and the obligation to contact Info-Excavation (1-800-663-9228) so that the companies concerned can locate underground services on the worksite.

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- .2 Repairs to broken elements shown on the plans will be at the Contractor's expense.

1.21 PROTECTION OF THE TREES AND SHRUB

- .1 The Contractor will not exceed the site limits. He must give a special attention, in order to protect the trees and shrubs located near those.
- .2 The trees, shrubs or damaged shrubs by the Contractor's work will be pruned and repaired, at the expenses of the Contractor, by a specimen accepted by the Representative of Parks Canada.
- .3 If the damage is too important, the damaged trees, shrubs or shrubs must be replaced without additional expenses, by specimen accepted the Representative of Parks Canada.

1.22 EXISTING SIGNALISATION PANELS

- .1 The Contractor must remove and reinstall, when necessary, the signalisation panels shown or not in drawings but identifiable at the time of the visit of site.
- .2 All the costs associated with this work must be included in the tender.

1.23 PROTECTION OF EXISTING STRUCTURES

- .1 The Contractor cannot, under any circumstances, encroach, move about, place materials or carry out work on existing structures without the authorization of the Representative of Parks Canada. In addition, he is required to take special care to protect structures located in the vicinity of the work.
- .2 Any structure damaged during the course of the work must be repaired by the Contractor and at his expense within 24 hours. Should he fail to do so, the Representative of Parks Canada reserves the right to have repairs carried out by another Contractor and to deduct the cost, progressively, from amounts committed.

1.24 DISTURBANCES OF THE ORIGINAL SOIL REDUCTION

- .1 Following measurements will be applied on the building site:
- .1 The soil located apart from the working areas will be compacted the least possible.
- .2 Barriers of protection against erosion will be set up.
- .2 The disturbance of the not built zones of the site will be reduced to the minimum and the existing slopes and levels will be preserved where indicated and everywhere where it is possible.

1.25 RIGHT OF WAY AND WORK SITE ACCESS

- .1 Before beginning work, The Contractor makes sure that the permit to use any land or passage are obtained. He also makes sure that works are carried out within the limits shown on drawings and/or specified in the right of way contracts.
- .2 The Contractor is always responsible for the damage to private property, whether or not he signed preliminary agreement with the concerned owners.

1.26 SUB-CONTRACTING

- .1 The Contractor is responsible for coordination with and among his sub-contractors. There shall be no direct correspondence between the Representative of Parks Canada and the Contractor's sub-contractors. No claim relating to coordination between the Contractor and his sub-contractors will be accepted.
- .2 The Contractor shall be responsible for ensuring that all items requested in the plans and specifications are included in the bid, which his sub-contractors presented via the BSDQ (Quebec Bid Depository System). If these items are missing from the sub-contractor's bids, the Contractor must include them in the bid he presented to the Owner.

1.27 SCALE DRAWING OF THE PROJECT

- .1 The Contractor is solely responsible for producing the scale drawing of the project, taking all measurements and ensuring full coordination.
- .2 Consequences of errors in these drawings will be at the Contractor's expense. The Contractor must establish the list of points before undertaking excavation work. The grading of the land can be changed on the worksite to improve drainage. Coordination among all stakeholders is required during production of the project's scale drawing.
- .3 If required, the list of points must be provided to the Representative of Parks Canada before work is undertaken. All elements that must be put into place must be supplied.
- .4 The Contractor must conduct a complete survey for the construction of the projected elements.
- .5 The Contractor must conduct a survey with the lines and levels required for any length of more than 15 m of the elements to be built.
- .6 The Contractor must carry out levelling work as well as supply the Representative of Parks Canada with technical stake-out information on the standardized lists, including chaining, the existing pavement elevation, the elevation of the projected

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stake head,, the difference between the stake and the projected pavement and their slope.

- .1 Perform offset chaining along the projected elements.
- .2 From the reference points, identify chaining at every 10 m as well as the start end of curbs, high and low points, etc.
- .3 Include costs relating to this surveying work in the bid.
- .7 The Contractor must provide, after culvert work but before pavement work, the curb culvert survey for the Representative of Parks Canada to validate. The survey must be carried out every 10 m and for every driveway. Once the Representative of Parks Canada has validated the survey, the Contractor will be authorized to carry out paving.
- .8 Once the work has been completed, the Contractor must produce a survey report on built elements and provide, one (1) month following the end of the work, a file on the points (x, y, z) of all elements built, in AutoCAD “.dwg” format.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- | | | |
|----|------------------------------------|------------------|
| .1 | Civil - Generalities | Section 31 00 00 |
| .2 | Civil - Top soil and Earthwork | Section 32 91 21 |
| .3 | Civil - Excavation and Backfilling | Section 31 23 11 |

1.2 OUTLINE OF WORK

- .1 Ensure work supervision and provide all labour, equipment, tools, materials, transport and the other necessary services to perform all work described and specified in the present section and the contract documents, including but not limited to: clearance, clearing, uprooting of trees of all dimensions, all trunks, located on the approved area of works by the Representative of Parks Canada, all shrubs, branches etc. excavation, stripping and topsoil storage for reuse, backfilling with approved granular materials and compaction of the specified surfaces in preparation for the various infrastructures and riprap protection for the current project.
- .2 The Contractor must completely clean the right of way of all materials coming from the deforestation, uprooting and clearing he carries out or resulting from work made before. Deforestation includes total removal of any tree, trunks etc. The Contractor must limit deforestation on the approved area of works by the Representative of Parks Canada. All must be charged, transported and disposed in a site in conformity with Soil Protection and Rehabilitation of Contaminated Sites policies of MDDEFP. Unless contrary instructions, the topsoil is firstly recovered and stockpile for reuse.

1.3 DEFINITIONS

- .1 Coarse clearance consists in cutting trees and undergrowth, just above the ground but not exceeding the prescribed height, and dispose of fell and windfall wood, stumps and other wood remains.
- .2 Fine clearance consists in cutting down to existing ground, standing trees, undergrowth, shrubs, roots, and stumps as well as the partially hidden logs, and dispose of other fell wood remains.
- .3 Clearing consists in removing the undergrowth, the deadwood and the trees whose trunk has a diameter less than 50 mm, and dispose of the remains.
- .4 Uprooting consists in tearing off the stumps and roots below the existing ground level but not lower than the prescribed level and dispose of these materials.

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1.4 STORAGE AND PROTECTION

- .1 Ensure adequate protection of trees, landscaping, natural elements, bench marks, water courses and roots of trees to be preserved.
 - .1 If necessary, repair the damaged element to the Representative of Parks Canada satisfaction.
 - .2 If the trees to be preserved are damaged, replace them in conformity with the Representative of Parks Canada requirements.

1.5 DEFORESTATION

- .1 Work of deforestation consists, but is not limited to, providing necessary material and labour to complete, according to good engineering practice, deforestation of wooded areas, as specified on drawings including:
 - .1 Trees felling strictly on the approved areas by the Representative of Parks Canada,
 - .2 Loading, transportation and disposal of waste and excavation surplus material in a site in conformity with Soil Protection and Rehabilitation of Contaminated Sites policies of MDDEFP

1.6 CLEARANCE AND UPROOTING

- .1 Work of clearance and uprooting consists, but is not limited to, providing necessary material and labour to complete, according to good engineering practice, clearance and uprooting of the site, for woody, marshy or any other areas, as specified on drawings including:
 - .1 Coarse and fine clearance, clearing, uprooting, topsoil removal,
 - .2 Topsoil or humus storage for reuse,,
 - .3 The drainage and the excavation dewatering, in conformity with requirements of section 32 23 11 Civil - Excavation and Backfilling
 - .4 Loading, transportation and disposal of waste and excavation surplus debris in a site in conformity with Soil Protection and Rehabilitation of Contaminated Sites policies of MDDEFP,

Part 2 Products

2.1 DISPOSAL SITE

- .1 The Contractor must provide the address of the disposal site where clearance and uprooting remain will be laid out. This site will be in conformity with Soil Protection and Rehabilitation of Contaminated Sites policies of MDDEFP.

Part 3 Execution

3.1 PREPARATION

- .1 Inspect the site and locate the elements to be preserved and make it approve by the Representative of Parks Canada. Advise public utility companies before beginning clearance and uprooting work.
- .2 Determine and delimit the topsoil storage areas.

3.2 COARSE CLEARANCE

- .1 Carry out cutting to a level not exceeding 500 mm above ground. The remaining stumps after clearance in areas to be uprooted are not to be higher than 500 mm above ground. Cut down the trees and cut the branches of the trees overhanging the cleared zone.

3.3 FINE CLEARANCE

- .1 Carry out cutting to a level less than 100 mm above ground.
- .2 Carry out fine clearance work by hand, not to damage the quagmire.

3.4 CLEARING

- .1 Clear the designated areas down to ground level.

3.5 UPROOTING

- .1 Tear off stumps and roots at least 300 mm below ground level.
- .2 Remove stones and visible fragments of rock of a volume less than 0,25 m³, but for which the biggest dimension is above 300 mm.

3.6 WOOD REMAINS REMOVAL AND DISPOSAL

- .1 Work of clearance, clearing and uprooting includes loading, transportation and disposal of these waste products in a site in conformity with Soil Protection and Rehabilitation of Contaminated Sites policies of MDDEFP,

3.7 FINITION

- .1 Leave the ground surface in such conditions allowing the immediate topsoil and humus removal and storage fo reuse, to the Representative of Parks Canada satisfaction.

3.8 TOPSOIL REMOVAL

- .1 In designated areas, following clearance, clearing and uprooting work, start topsoil removal. Unless indicated otherwise, strip all topsoil and humus within the work perimeter and avoid mixing it with the underground soil.
- .2 The layer of arable or vegetal land or any other vegetal remains must be removed according to the directives of the Representative of Parks Canada.
- .3 This cut, even if the Representative of Parks Canada requires it is made separately or by material sorting, is a 2nd class excavation.
- .4 Pile up topsoil and humus in designated areas and protect it to avoid contamination. The height of piles will not exceed 2 m.
- .5 Before sowing or turfing, in conformity with Soil Protection and Rehabilitation of Contaminated Sites policies of MDDEFP, dispose of topsoil surpluses that are not be used for this project.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1	Civil – Generalities	Section 31 00 00
.2	Civil – Clearance and uprooting	Section 31 11 00
.3	Civil – Roadworks	Section 32 11 00
.4	Civil - Storm - Culverts	Section 33 31 00
.5	Civil – Topsoil and Finish Earthwork	Section 32 91 21

1.2 SCOPE OF WORK

- .1 Ensure the supervision of work and supply all manpower, equipment, tools, materials, transportation and other services needed to carry out and complete all work described and specified in this section and contract documents including, but not limited to: excavation, stabilization, backfilling using approved granular materials and the compaction of excavations for the replacement of culverts.
- .2 The excavation and backfilling work described in this section refers to the excavation and backfilling of the trench for underground utilities as well as for large-scale excavation and backfilling work.
- .3 Excavations and backfilling include all necessary work to bring the infrastructure to the longitudinal and transverse profiles indicated on drawings or required by the Representative of Parks Canada.
- .4 According to the nature of removed materials, the excavation is of 1st or 2nd class.

1.3 REFERENCES

- .1 Bureau de normalisation du Québec (BNQ):
 - .1 NQ 2501-255 : Soil - Determining the moisture-unit weight ratio - Test with modified compaction energy (2 700 kN.m/m³).
- .2 Ministry des Transports du Québec:
 - .1 Cahier des charges et devis généraux du Québec - Infrastructures routières, Construction et réparation (latest edition) (Statement of Work and General Specifications – Road infrastructures, Construction and Repairs).

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- .2 Cahiers des Normes, Ouvrages Routiers, Tome VII "Matériaux" (Standards, Roadwork, Vol. VII "Materials", latest edition).
 - .1 2101 Standard - Aggregates
 - .2 2102 Standard - Granular materials for the base, sub-base, paved surface and shoulder.
 - .3 2103 Standard - Granular materials for the cushion, surround, anti-contamination layer and filter layer.
- .3 Cahier des Normes Tome III « Ouvrages d'art » (Standards Roadwork, Volume III, latest edition)

1.4 DEFINITIONS

- .1 Additional excavation: any excavation work requested in writing by the Representative of Parks Canada in addition to that called for in the specifications.
- .2 Backfill materials: material placed over the surround or protective layer up to the level of the infrastructure, the definitive ground level or the natural soil.
- .3 Backfilling: operation, which consists in filling the trench and/or excavation using bedding, surround, fill material or borrow material.
- .4 Bedding material: bed for the pipe's installation.
- .5 Surround: material between the top of the bed and the underside of the fill or borrow material..
- .6 Off-site borrow material: material from a source outside the worksite, which is required to fill excavations, build embankments, or other work when the excavated material is not reusable according to geotechnical specifications or are in short supply
- .7 Reusable excavation material: material identified by the Representative of Parks Canada and according to the geotechnical advises as suitable for specific fill applications. This material can be obtained from any excavation on the worksite.
- .8 Classes of excavated material: two classes of excavated material are recognized, i.e., rock excavation (1st class excavation) and common excavation (2nd class excavation).
- .9 1st class excavation: refer to article « 1st class excavation » of the section « Execution ».
- .10 2nd class excavation: excavation of material of whatever nature other than that covered by the definition of excavation 1st class, including dense till, compact clay, frozen materials and partly cemented materials, which can be

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ripped and excavated using heavy equipment. Stripping is considered to be 2nd class excavation.

- .11 Stripping: removal of organic material initially covering the ground, including land clearing materials.
- .12 Topsoil: any material likely to favor the growth of vegetation and capable of being used as complementary soil for landscaping or seeding. Furthermore, if it is present on the site, this material must be excavated where specified on the work site. Finally, this material is unsuitable for use as fill.
- .13 Digging of trenches: 1st or 2nd class excavation required for the construction of a trench for laying pipes and their accessories.
- .14 Unshrinkable fill: controlled density mix consisting of cement and aggregates.
- .15 Waste material: excavation materials unsuitable for reuse (trees, shrubs, bushes, branches, brush, stumps, dead wood and other vegetation waste and materials containing demolition debris) or surplus materials, which cannot be reused.

1.5 ELEMENTS TO BE SUBMITTED

- .1 The Contractor shall refer to Section 01 33 00 - Submittal Procedures and Documents.
- .2 Prior to the start of excavation work, the Contractor shall submit to the Representative of Parks Canada, for verification and approval details of dewatering and heave protection methods as required before undertaking the work.
- .3 Before starting work, the Contractor shall perform a complete topographic survey of the roadway, shoulders, surrounding land to replace the culvert, etc. and that on the whole work area.
- .4 Any non-compliant material shall be replaced by materials approved by the Representative of Parks Canada and the work shall be redone at the Contractor's expense.
- .5 Provide the Representative of Parks Canada with a laboratory analysis confirming that the aggregates to be used as fill do not contain pyrite.

1.6 PROTECTION OF EXISTING UTILITIES

- .1 Existing utilities and structures.
 - .1 Before undertaking any excavation work, the Contractor has both the responsibility and the obligation to contact Info-Excavation (1-800-

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- 663-9228) in order for the companies concerned to identify the location of underground utilities and services present on the worksite.
- .2 Information relating to public utilities is based on available documents. It is provided to the Contractor for guidance purposes only and should not be considered to be complete or accurate.
 - .3 Should private or public structures or utilities be found, whether or not they appear on the plans or are indicated on the contract property, crossing or close to projected excavation work, above or below ground, it is the Contractor's responsibility to obtain from the owners of these services and/or public utility organizations and companies all required information on the existence, nature, location, size, depth, etc. of these utilities or services.
 - .4 The Contractor must, himself, and at his expense, conclude agreements with the companies concerned with regards to the procedure and program of the work to be carried out. He must transmit this program to the Representative of Parks Canada at least forty-eight (48) hours before work is to start near the structures that must be protected.
 - .5 The Contractor must take all measures required to protect these structures against breakage and frost and/or provide the support needed to prevent collapse throughout the execution of the work which, even once it has been completed, must in no way affect the stability, quality and safety of existing structures. The Contractor alone is responsible for any and all damages incurred as a result of his work. All work to protect and support existing utilities or structures, including digging, is at the Contractor's expense.
 - .6 Digging must be carried out to determine the exact location, depth, and dimensions of the underground services encountered, whether or not they appear on the plans. Excavation in the ground, whether frozen or not, is done by hand on each side of the existing underground services, over a distance of 1,5 m (5.0 ft.) and below, to the underside of the services involved. No additional remuneration will be granted for this work. The use of explosives is prohibited in this instance.
 - .7 Obtain appropriate directives from the Representative of Parks Canada before moving or removing the utilities or structures identified in the excavation zone.
 - .8 Note the location of the underground utilities retained, moved or abandoned.
 - .9 In addition, the Contractor shall provide back into its original state, the land on which he performed the work, and on the total width of the right of way or easement owned by the company concerned.

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1.7 CONDITION OF THE WORKSITE

- .1 Take into account the location and special conditions of worksite.
- .2 Take into account the level of the groundwater table and its impact on excavation conditions.
- .3 In the event that contaminated materials are detected during construction, these excavated materials must be managed in compliance with prevailing environmental and municipal regulations. Moreover, excavated materials containing demolition debris must be managed as “dry materials”.
- .4 The Contractor must coordinate his work with that of all other contractors, companies or public utility firms carrying out work of any nature whatsoever during the time when work covered by this contract is in progress.

1.8 SHORING AND BRACING OF EXCAVATIONS AND STRUCTURES

- .1 Shore and brace excavations to avoid slides, in compliance with construction safety codes, local regulations as well as the recommendations of the geotechnical advise.
- .2 During excavation work, the Contractor must build the embankment(s) required and/or supply and install all steel sheeting, temporary support walls, cofferdams, bracing or other support required to successfully carrying out excavation work. The Contractor is fully responsible for the above-mentioned items.
- .3 All excavations in the vicinity of existing structures must be limited, and adequate shoring and bracing of existing excavations and exposed structures must be provided.
- .4 The Contractor is solely responsible for the choice of excavation methods used.
- .5 The Contractor is fully responsible for any damage to existing installations and services or any bodily injury resulting from the absence or precariousness of the temporary structures and/or improper leveling of the embankment.
- .6 The Contractor must provide a plan of these structures signed and sealed by an engineer who is a member of the Ordre des ingénieurs du Québec (OIQ - Quebec Order of Engineers).

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1.9 PROTECTIVE MEASURES

- .1 Protect the bottom of excavations against any softening and should this occur, remove the softened soil and replace it with compacted MG-20b type granular materials.
- .2 Protect the bottom of excavations against frost.
- .3 Excavation and backfilling work must be carried out in compliance with the construction safety code and recommendations of the geotechnical advise.
- .4 Ensure the protection of vertical benchmarks, layout benchmarks, survey markers and geodesic monuments.
- .5 Never stockpile excavated material where it could interfere with the work, drainage or the stability of excavation slopes.
- .6 The Contractor is, at all times, responsible for protecting stockpiled materials, which he will store on the site or other location reserved for this purpose, In the case of debris and excavation surplus, he must determine their granulometric qualities and other physical characteristics, to determine whether they can be reused as priority fill materials. In the event of inadequate protection, the loading, transportation and disposal of this material at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy will be at the Contractor's expense.
- .7 At all times, the Contractor is required to take the necessary measures to keep dust generated by his work to a minimum.
- .8 At the end of each work day, all excavations must be secured to the satisfaction of the Representative of Parks Canada.

1.10 INSPECTION AND TESTS

- .1 The analysis and testing of materials and compaction are carried out by a specialized testing laboratory designated by the Parks Canada.
- .2 Parks Canada assumes the cost of the inspection and laboratory analyses. If, because of non-compliance, these tests must be repeated, costs shall then be assumed by the Contractor.
- .3 Granulometric analysis: fill materials are analyzed to determine their suitability for the projected use and their compliance with specifications.
- .4 Density analysis: tests are conducted on compacted materials in compliance with the NQ 2501-255 standard : Soil - Determining the moisture-unit weight ratio - Test with modified compaction energy.

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- .5 Compaction tests:
 - .1 The Owner reserves the right to have compaction tests carried out to determine if the required compactness has been achieved. The Contractor must collaborate on the execution of these tests and can base no claim on work stoppage or other loss of time resulting from the execution of these tests.
- .6 Testing frequency is defined by the Representative of Parks Canada.
- .7 This same laboratory must provide the Representative of Parks Canada with progressive reports confirming that the required tests have been conducted as required by the plans and specifications. Moreover, the laboratory must provide the Representative of Parks Canada with a final report confirming that all fill complies with the plans and specifications, and no concrete or pavement can be placed until this report has been provided.
- .8 Should the Contractor use a fill material other than the one sampled, all fill materials will have to be removed and replaced at his expense.

1.11 DENSITY OF COMPACTED MATERIAL

- .1 When compacted, fill material must have moisture content as close to the optimum determined by the laboratory using the maximum dry density test in keeping with the NQ 2501-255 standard. Sprinkle water on overly dry soil, taking care to avoid saturation.
- .2 The density of the compacted material is expressed as a percentage of the Modified Proctor maximum dry density.

1.12 GROUNDWATER TABLE

- .1 Limit the depth of the excavation to avoid problems relating to the stability of the bottom.
- .2 The Contractor is entirely responsible for the excavation measures required and adequate pumping to reduce the level of the groundwater table where required, as well as the control of the groundwater table while work is in progress, and all other additional work required by conditions encountered along the way.
- .3 All costs related to measures covered by the previous article must be included in the bid and no request for additional funds or schedule delay will be considered, should the Contractor have failed to take these into account.

1.13 STORM WATER MANAGEMENT AND EROSION AND SEDIMENTS CONTROL

- .1 The ecological strategy of design asks for a protection plan against erosion to reduce the negative effects of this phenomenon on the quality of air and water. The plan satisfies the following objectives:
- .2 Use all means in order to clear evacuated rain water or discharged water from solid or floating particles and mud and prevent any contaminants contain in surface water from running off.
- .3 During work, storm water will be retain using a filter fence as described further.

1.14 HIDE ELEMENTS

- .1 The Contractor covenants that it will hide any work such as pipes or otherwise, without first obtaining permission to backfill the Representative of Parks Canada.

1.15 1ST CLASS EXCAVATION BY DYNAMITING

- .1 Excavation of first class blasting can only be achieved if the Contractor obtains written authorization from Parks Canada.
- .2 Work concerning 1st class excavation by dynamiting consists in, but not limited to, supplying the materials and manpower required to carry out 1st class excavation by dynamiting work in keeping with good engineering practices, including:
 - .1 Drilling,
 - .2 Supply and installation of dynamite,
 - .3 Dynamiting of block of a dimension superior to 0,8 m³,
 - .4 The loading, transportation and disposal of excavation surplus at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy,
 - .5 The location of public utility or service,
 - .6 The protection of existing structure,
 - .7 The dewatering of excavations,
 - .8 The compaction of fill, the shaping and compacting of the infrastructure.

1.16 1ST CLASS EXCAVATION BY MECHANICAL COMMUNITION

- .1 Work concerning 1st class excavation by mechanical communiton consists in, but not limited to, supplying the materials and manpower required to carry out 1st class excavation by mechanical communiton work in keeping with good engineering practices, including:

- .1 The necessary machinery and manpower to break the rock mechanically using equipment of the type "Tramac" or "ripper",
- .2 The loading, transportation and disposal of excavation surplus at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy,
- .3 The location of public utility or service,
- .4 The protection of existing structures,
- .5 The dewatering of excavations,
- .6 The compaction of fill, the shaping and compacting of the infrastructure.

1.17 2ND CLASS EXCAVATION

- .1 Work involving 2nd class excavation consists in, but is not limited to: supplying the materials and manpower required to carry out 2nd class excavation work in keeping with good engineering practices, including:
 - .1 The loading, transportation and disposal of excavation surplus at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy,
 - .2 and any other public utility or service,
 - .3 The protection of existing structures,
 - .4 The dewatering of excavations,
 - .5 The compaction of fill, the shaping and compacting of the infrastructure.

1.18 BORROW MATERIALS

- .1 Work relating to borrow materials consists in, but is not limited to supplying the materials and manpower required to carry out the supply and application of borrow materials, according to good engineering practices, including:
 - .1 The dewatering of excavations,
 - .2 The supply, placement and compaction of borrow materials,
 - .3 The shaping and compacting of the infrastructure.

1.19 EXTRA CRUSHED STONE FOR BEDDING

- .1 Work relating to extra crushed stone for bedding consists in, but is not limited to excavate any soft material under the seat and to supplying the materials and manpower required to carry out the supply and application of extra crushed stone for bedding, according to good engineering practices, including:
 - .1 The dewatering of excavations,

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- .2 The supply, placement and compaction of the extra crushed stone for bedding,
- .3 The loading, transportation and disposal of excavation surplus at a site complying with the directives of the MDDEP's Soil Protection and Contaminated Sites Rehabilitation Policy.

1.20 CLASS A GRANULAR MATERIALS

- .1 Work relating to Class A granular materials consists in, but is not limited to supplying the materials and manpower required to carry out the supply and application of Class A granular materials, according to good engineering practices, including:
 - .1 The dewatering of excavations,
 - .2 The supply, placement and compaction of Class A granular materials replacing excavated materials.

1.21 LOCATION OF EXISTING SERVICES

- .1 Work relating to the location of existing services consists in, but is not limited to, supplying the materials and manpower required to locate existing services, according to good engineering practices, including:
 - .1 The dewatering of excavations,
 - .2 The supply, placement and compaction of Class A granular materials replacing excavated materials,
 - .3 The loading, transportation and disposal of excavation surplus at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy,
 - .4 The compaction of fill, the shaping and compacting of the infrastructure,
 - .5 The protection and repair of public utilities and services.

1.22 EXCAVATION VOLUME

- .1 The excavation volume is obtained multiplying the trench length by the average cross section area, measured every 15 m maximum, following the theoretical section.

1.23 EXCAVATION SURPLUS

- .1 If the Contractor remove an excavation volume greater then the one determine by the theoretical section, no additional remuneration is allowed.

1.24 ROCK MEASURING

- .1 The rock is paid according to volume in place before dynamiting or mechanical fragmentation. The level of the rock in place before dynamiting or

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mechanical fragmentation is established on site by the Representative of Parks Canada in the presence of the Contractor. The Contractor must warn the Parks Canada Representative each time he meets rock or another material payable with the item "dynamiting of 1st class material". If the Contractor neglects informing the Representative of Parks Canada, the Contractor cannot claim any reclamation for dynamiting 1st class material excavated without the Representative of Parks Canada or its representative on worksite.

Part 2 Products

2.1 BEDDING AND SURROUND MATERIALS FOR PIPES AND UNDERGROUND STRUCTURES

- .1 The bedding and surround of underground structures shall be made according to the DN-III-4-002 standard drawing MTQ are produced using MG-20b calibre granular materials complying with the Quebec Department of Transport's 2101 and 2103 standards shown in the tables appearing in the "Granular Materials" article, and whose petrographic number is 300 max. with $MgSO_4$ (NQ2560-450) durability of 35 % max.
- .2 When two successive layers of materials are not enough to meet the granular requirements for an anticontamination layer, a geotextile must be used to separate the two layers.

2.2 RECYCLED MATERIALS

- .1 The recycled materials must meet the standard « Granulats - Matériaux recyclés fabriqués à partir de résidus de béton, d'enrobés bitumineux et de briques - Classification et caractéristiques » NQ 2560-600. The information concerning the use of recycled materials is given in different appendices of this standard according to classification and characteristics of these materials.
- .2 The use of recycled materials may be used only with the approval of the Representative of Parks Canada is governed by all the other technical requirements appearing within the present estimate as for compactness, thickness of layers, etc.

2.3 GRANULAR MATERIALS

- .1 As granular materials, use only natural non-plastic soil such as sand or graded crushed stone as stipulated in the specifications. These materials must comply with the Quebec Department of Transport's 2101 and 2102 standards relating to the granulometry and physical and mechanical properties of the aggregates. Materials must first be approved by the laboratory and the Representative of Parks Canada.

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- .2 The diameter of the crushed stone must not exceed one third of the thickness of the base layer or larger than 112 mm.
- .3 The granular materials must satisfy the requirements of standard MTQ 2102:
- .4 Class MG-112 granular materials or sand can also be used as excavation fill and backfill.
- .5 The grading envelopes of granular materials must meet the requirements of the following "Grading Envelope of Granular Materials" table while the physical and mechanical properties of the granular materials must meet the requirements of the following "Physical Properties of Aggregates for the Roadway Infrastructure and Base Course" table:
- .6 Conformity: All granular materials not respecting the requirements enumerated previously are refused and must be replaced by materials in conformity with the following requirements.

Grading Envelope of Granular Materials

Granular materials	Sieve (mm)									Sieve (µm)			
	112	80	56	31,5	20	14	10	5	1,25	630	315	160	80
(% passing)													
MG-20	-	-	-	100	90-100	68-93	-	35-60	19-38	-	9-17	-	2-7
MG-20b	-	-	-	100	90-100	68-93	-	35-60	19-38	-	9-17	-	5-11
MG-56	-	100	82-100	55-85	-	-	-	25-50	11-30	-	4-18	-	2-7
MG-112	100	-	-	-	-	-	-	12-100	-	-	-	-	0-10
MG-112 modified	100	-	-	-	-	-	-	20-75	-	-	-	-	0-10
Installation bed	-	-	-	-	-	-	100	95-100	50-85	25-60	10-30	-	0-10
Stabilized sand	-	-	-	-	-	-	100	95-100	50-90	25-65	10-35	4-25	-

** To be respected before and after compaction.*

Physical Properties of Aggregates for the Infrastructure and Base Course

Designations	Physical properties					
	Organic Matter max. (%)	Micro-Deval (MD) (%)	Fragmentation min.	Los Angeles (LA) (%)	MAX. (%)	Blue Value
	Standards					
	LC 31-228	NQ 2560-070	LC 21-100	BNQ 2560-400	MD + LA	BNQ 2560-255
MG-20	0,8	35	50	50	80	0,20
MG-20b	0,8	35	50	50	85	0,20
MG-56	0,8	35	50	50	80	0,20
MG-112	0,8	40	-	50	85	0,20

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2.4 BACKFILL MATERIALS

- .1 Backfill materials must be approved by the Representative of Parks Canada prior to their use. They are from site or borrow excavations (Class B) for use beneath the roadway infrastructure line.
- .2 All compactable materials and comply with the 1101 standard MTQ can be used if they meet the requirements of Article 11.6.1 of the CCDG MTQ except organic soils, contaminated soil and frozen soil. Soil components must be mineral in nature. The use of these materials depends on their condition, the height of the embankments to be built and weather conditions. If required by the plans and specifications, the condition of the materials must be improved using an appropriate treatment. A reference board or particle size analysis should be performed on the excavated materials, and, as mentioned in the geotechnical advise.
- .3 Materials must be free of foreign bodies such as brick fragments, roots, trees, lawn, ash, fly ash, frozen soil, contaminated soil, snow, ice, etc.
- .4 Backfilling of excavations over the pipe surround and beneath the level of the infrastructure must use excavation surplus deemed acceptable by the Representative of Parks Canada or granular borrow materials free of organic matter, with a maximum size of 150 mm (6 in.) on its largest face, (except for the last 300 mm in the infrastructure or the size of the rocks line should be less than 100 mm), placed and compacted in successive layers no thicker than 300 mm (12 in.) to a minimum of 90 % of Modified Proctor density to 150 mm beneath the infrastructure line. The last 150 mm will be compacted to 95 % of Modified Proctor.

2.5 “CLASS A” GRANULAR MATERIALS

- .1 “Class A” granular materials are natural non-plastic soil such as sand, gravel or stone. The diameter of the stones must not exceed one third of the thickness of the fill layers or 112 mm at their largest.
- .2 These materials are frost-proof and can be used for sub-bases, submerged backfill, and the backfilling of excavations.
- .3 “Class A” granular materials must have the following granulometry as well as meet the following physical and mechanical requirements:

Grading Envelope of "Class A" Granular Materials

Granular materials	Sieve (mm)									Sieve(µm)			
	112	80	56	31,5	20	14	10	5	1,25	630	315	160	80
(% passant)													
Gravel and sand (MG-112)	100	-	-	-	-	-	-	12	-	-	-	-	0-10
Stone dust, manufactured sand	-	-	-	-	-	-	100	75-100	-	-	-	4-25	0-10

- .4 The Representative of Parks Canada can accept a percentage of 0-15 passing through a sieve with openings of 80 µm if the material is located beneath the frost line, a depth of 1,8 m.

Physical Properties of Aggregates for "Class A" Granular Materials

Physical Property						
Organic matter max. (%)	Micro-Deval (MD) (%)	MgSO4 Durability (%)	Fragmentation min	Los Angeles (LA) (%)	MAX. (%)	Blue Value
Standards						
LC 31-228	NQ 2560-070	BNQ 2560-450	LC 21-100	BNQ 2560-400	MD + LA	BNQ 2560-255
0,8	40	35	-	50	85	≤0.2

2.6 UNSHRINKABLE FILL

.1 Generalities

- .1 The unshrinkable fill must be provided by a dosage plant certified by the Association Béton-Québec (Quebec Concrete Association) in keeping with the NQ 2621-900 standard. The hardened material must allow for easy excavation at all times.

.2 Materials

- .1 The Portland cement must comply with the requirements of the CSA CAN3-A5 type 10 or 30 standard.
- .2 Fine and coarse aggregates must meet the requirements of CSA standard CAN3-A23.1-M. The granulometry must comply with Table 1 of this same standard.
- .3 Batch water must meet the requirements of the CAN3-A23.1-M standard.
- .4 Air-entraining admixtures must comply with the requirements of the CAN3-A266.1-M standards.
- .5 The unshrinkable fill must contain a maximum of 25 kg/m³ of Type 10 Portland cement. In winter, Type 30 Portland cement can be used.

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- .3 Characteristics
 - .1 The slump of unshrinkable fill must be between 150 mm and 200 mm.
 - .2 When air entrainment is required, the total content in measured air must be between 4 % and 6 %, in compliance with the CAN3-A23.2 standard.
 - .3 The maximum compressive strength measured in compliance with the CAN3-A23.2 9C standard is in the order of 0,5 MPa to 0,6 MPa, and can be excavated using a power shovel.
- .4 Placement
 - .1 In areas where the work crosses public utilities or services, the unshrinkable fill can be used by the Contractor to replace other backfill materials. The unshrinkable fill can be used as a bed and/or surround for an underground pipe or element.
 - .1 High-speed blending of the mix prior to placement, to avoid segregation.
 - .2 Unloading at maximum speed, in keeping with site conditions.
 - .3 Backfilling of excavation from the low point to the high point.
 - .4 The use of a flexible dispensing tube is prohibited.
 - .5 At all times, avoid moving the fill once the initial consolidation phase has been completed, i.e. after 15 to 20 minutes.
 - .6 Can be excavated using a backhoe (density equivalent to compacted soil).
 - .2 No roadway foundation and/or structure are to be installed over unshrinkable fill until 6 hours after the latter has been placed.
 - .3 Any unshrinkable fill affected by frost, before and/or following its placement, must be removed and replaced.

2.7 FILTER FENCE OR SEDIMENT BARRIER

- .1 The filter fence or sediment barrier will be built as shown on the details.
- .2 Sediment barrier will Terrafence type of Texel or approved equivalent, including geotextile membrane and wooden posts.

Part 3 Execution

3.1 SITE PREPARATION

- .1 Within set limits and approved by the Representative of Parks Canada, remove obstacles, ice and snow from the surface of the excavation zone.

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- .2 Before undertaking excavation work, carefully cut pavement, first along limits of the proposed excavation for the replacement of culverts, and secondly for the reconstruction of the roadway allowing the surface to break off cleanly and evenly. Materials removed must be disposed of off-site, in keeping with the article "Disposal of waste materials" in this section.
- .3 Roads and access ramps must be built on the worksite, as needed, and maintained by the Contractor throughout the duration of excavation work.

3.2 EXCAVATION EQUIPMENT

- .1 Excavation equipment must be suited to the projected work and sized to carry it out effectively.

3.3 THEORETICAL EXCAVATION AND FILL LINES

- .1 A theoretical typical section of a trench excavation shall comply with both BNQ and CSST standards.
 - .1 Pipe (domestic sewer, storm sewer, waterworks and fire protection).
 - .1 For sewer and waterworks, the width of the floor of the trench shall be equal to the outer diameter of a pipe plus 600 mm, and shall, in no case, be smaller than 900 mm.
 - .2 The theoretical walls of the excavation shall have slopes of the following ratios:
 - in the ground: 1,5 H : 1 V or according to the CSST, whichever is the most restrictive.
 - in rock: 1 H : 10 V or according to the CSST, whichever is the most restrictive.
 - .3 Regardless of the type of soil, the depth of the trench shall be determined by the depth of the top of the pipe plus the latter's outer diameter, plus the thickness of the bed.
 - .2 It is understood that the Contractor shall, at all times, comply with the "Code de sécurité pour les travaux de construction" (Safety Code for Construction Work) in effect in the province of Québec.

3.4 TRENCH MAXIMUM WIDTH

- .1 For the sewers piping (culverts), the selected and specified class of pipes depends partly on the trench width at the top of the pipe.
- .2 The trenches maximum widths tolerated at the top of the sewer pipe are the following:

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Pipe diameter (mm)	Allowed maximum width of excavation at the top of the pipe (m)
455 and less	1,20
535	1,35
510	1,50
685	1,65
760	1,80
915	1,95
1065	2,25
1220	2,55
1370	2,90
1525	3,20
1675	3,50
1830	3,80
1980	4,10
2135	4,40
2285	4,70
2440	5,00
2745	5,30
3050	5,60
3060	5,90

- .3 The Contractor must have underpinning in conformity with the requirements of the CSST regarding the excavation widths.

3.5 1ST CLASS EXCAVATION

.1 Generalities

- .1 The 1st class excavation includes the removal of the rock and the concrete works or strongly cemented masonry, as well as stones of a dimension equal or higher than 0,8 m³. The 1st class excavation also includes the removal of massive or schistous rock formations, whose extraction can be adequately made only after being beforehand broken using a ripper.
- .2 The stone beds in clay, the disaggregated schist, the resistant ground "hard pan" and the cold ground do not constitute 1st class excavation, even if their extraction cannot be done adequately using a general purpose excavator.

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- .3 Rock cutting must be confined within the theoretical limits indicated by the Parks Canada Representative. The slope inclinations must be of 5 V : 2 H (5,0 m vertically over 2,0 m horizontally). Any rock point salient on the cut walls must be struck off and the rock fragments, broken or cracked, must be removed.
- .4 At the bottom of the cut of rock, any point salient of more than 80 mm above the required level must be struck off. Depressions under the infrastructure line must be filled by MG-20b stone or MG-112 up to the required level. This backfilling must be made at the expenses of the Contractor.
- .5 The measuring of 1st class excavation is carried out by the Representative of Parks Canada in the presence of the Contractor's representative. The Contractor must warn the Representative of Parks Canada each time he meets rock or another 1st class excavation material. If the Contractor neglects informing the Parks Canada Representative, the Contractor cannot claim any reclamation for 1st class material excavated without the Representative of Parks Canada.
- .6 The Contractor cannot claim any compensation for the composition, the hardness or the type of rock formation encountered; making its extraction more expensive than envisaged.
- .2 Disposal of 1st class excavated material
 - .1 The Contractor must dispose 1st class excavated materials in conformity with the requirements of article "Excavation surplus disposal".
 - .3 1st class dynamited material
 - .1 The 1st class dynamited material is applicable to volumes of solid rock and the strongly cemented works out of concrete or masonry requiring the use of explosives, just as with the volume of stones of a dimension equal or higher than 0,8 m³. The 1st class dynamited material is also applicable to the volume of massive or schistous rock formations whose extraction can be adequately made only after being beforehand broken, by the use of explosives. The rock must be dynamited fine enough fine to be able to be re-used for backfilling.

3.6 2ND CLASS EXCAVATION

- .1 2nd class excavation includes all excavations, which are described as 1st class excavation in the preceding article.
- .2 Notify the Representative of Parks Canada at least one week prior to the start of excavation work and, in his presence, note the land's natural profile where required.

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- .3 Dig trenches along the theoretical lines, cross-sections, layouts, levels and dimensions indicated.
- .4 Completely excavate all topsoil and organic material. This material may not be used as fill, but must be piled and reused for revegetation in some areas. Debris from materials such as bricks, concrete, wood, old paving, riprap, walls, stone fences etc., May be encountered during excavation. The materials must be managed as "dry materials". Refer to the section "Layout scrap materials" in this section.
- .5 Build temporary structures at the required location, depth and height.
- .6 Dig trenches needed for laying underground pipes. Flatten and shape the bottom of the trenches and eliminate any irregularities, clumps or ruts.
- .7 Smooth the bottoms of the trench depending on the type of bed stipulated and firm it up by tamping down or other means, which the Representative of Parks Canada deems satisfactory to ensure a foundation capable of supporting a pipe in position.
- .8 The bottom of the excavations must be level, consist of dry, undisturbed soil, and free of organic or loose matter. Reworked soil must be removed by hand.
- .9 Fill unneeded excavations at no additional cost, as follows: The excavation shall be filled using excavation materials deemed to be reusable, free of stones measuring more than 150 mm (6 in.) in diameter, frozen material or organic matter. Voids will be filled using a finer material. The Contractor shall compact materials to 90 % of the Modified Proctor in successive layers with a maximum thickness of 200 mm (8 in.), until the level required to restore and/or shape the infrastructure of existing or projected elements. If excavation surplus is deemed to be non-reusable, the Contractor shall use borrow materials approved by the Representative of Parks Canada. Compacted fill shall be installed along the entire width of the excavation.
- .10 Once the excavations have been completed, ask the Representative of Parks Canada to inspect their depth and dimensions. No filling can be carried out without the authorization of the Representative of Parks Canada.
- .11 Take all precautions needed to prevent damage to existing services.
- .12 If excavation and backfilling work is to be carried out in winter, the bottom of excavations must be protected against frost.

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3.7 TRENCH UNDERPINNING

- .1 If, due to instability of the excavated walls, it becomes necessary to use excavation box, the sheeting steel piles or wood underpinning, to support the trench walls and to avoid damage or accidents, the Contractor must carry out this work without additional compensation. If the Representative of Parks Canada judges it necessary, for the protection of the existing works or to prevent neighbouring landslip, he can require that wood underpinning is left in the trench. The sheeting steel piles must always be removed.
- .2 Excavation box of the trench is required for the culvert RP_02010 given the materials in place to limit the width of the excavation to allow traffic on a channel. In addition to supporting the land, the support system must be designed to withstand vehicular traffic in the vicinity of the support. The parameters for calculating the shoring are indicated in the geotechnical recommendations attached.
- .3 At any time, the Contractor is the only person in charge of the support of the trench walls and it must be in conformity to the requirements of the Ministère du Travail related to excavation work and contained in the publication entitled: "Security standards on the Building sites of Construction" or any other more recent publication of this Ministry relative to this work.
- .4 The Contractor shall provide a plan of the works signed and sealed by a member of the Order of Engineers of Quebec (OIQ) Engineer.

3.8 DEWATERING OF EXCAVATIONS

- .1 The Contractor must plan for all pumping work required keeping excavations dry. A pumping system must be installed when required and its capacity must be sufficient to drain surface water or water from infiltrations or leaks from the sewer pipes, water mains or other artificial elements. Precautions must be taken when the soil is silty or sandy, to avoid taking in fine particles To this end, the Contractor must refer to the geotechnical study.
- .2 Submit, to the Representative of Parks Canada, for verification, details of dewatering and heave protection methods, such as the installation of dikes, well points and sheet-pile cut-offs.
- .3 Before the start of pumping work, the Contractor must confirm the condition and capacity of ditches and storm or combined sewers into which the water is pumped. He is responsible for flooding and all property damage caused by the pumping of this water. The clean-up of accumulations of soil or other debris resulting from the pumping into existing pipes shall be at the Contractor's expense.

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- .4 Install and operate the dewatering system so as to avoid lowering the level of the groundwater table outside the excavation to a point that could damage or threaten adjacent structures.
- .5 The Contractor shall, at his expense, put up, install and operate all equipment needed to keep excavations dry during construction.
- .6 In the event of an emergency (including breakdowns) an adequate pumping system in good working order must be available at all times. Moreover, workers capable of operating this system must also be available at all times.
- .7 If there is a risk of soil liquefaction or heaving, avoid excavating beneath the groundwater table. To avoid pipeline upheaval or excavation bottom heave, lower the level of the groundwater table or use other appropriate means.
- .8 Protect open-cut excavations against flooding and other damages, which could result from runoff.
- .9 All surface or groundwater, whether they are from natural sources, precipitation, melting snow, ice, infiltration, leaks or outflow from sewer pipes or other artificial element, must be drained, at the Contractor's expense. The Contractor is entirely responsible for water control, which must comply with prevailing municipal and provincial environmental regulations.

3.9 PREPARATION OF THE EXCAVATION FLOOR

- .1 Any excavation in the ground, within 150 mm of the finished level is removed manually or mechanically, taking great care to avoid disturbing the natural bottom, unless the Representative of Parks Canada has directed otherwise. When excavating in clay, the teeth of the excavation bucket shall be continuous, with no space in between.
- .2 Laying pipes on the bottom of a muddy or flooded trench is prohibited. The Contractor must dewater and prepare the trench, ensuring that it is firm and solid before installing the pipe bed. If needed, the Representative of Parks Canada can require that the infrastructure be compacted anew before laying the bed for the pipes. In cold weather, the bottom of the trench must also be protected against frost.

3.10 UNSTABLE SUB-BASE

- .1 Every time materials constituting the floor of an excavation, which has been brought to the level indicated on the drawings or the Representative of Parks Canada, are found to be too soft or, for whatever other reason, inadequate for supporting a pipe or other element to be built, the Contractor must excavate to a greater depth and build a special base, as required by the Representative of Parks Canada.

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- .2 Various additional works required for stabilizing the pipe bed are as follows (at the Parks Canada Representative's choice):
 - .1 Geogrid.
 - .2 Additional excavation, transportation and leveling.
 - .3 Reinforced geotextile.
 - .4 Unshrinkable fill.
 - .5 Concrete and steel reinforcements in place.
 - .6 Crushed stone, crushed gravel, sand, etc.
- .3 If the Representative of Parks Canada considers that the condition of the soil, which is soft or unsuitable for whatever reason, is due to unavoidable conditions, special base work can then be carried out by the Contractor, as instructed by the Representative of Parks Canada.
- .4 Especially for culvert RP_02010, there is the presence of soft clay under the existing culvert (see letter on geotechnical recommendations culvert RP_02010). The soft clay must be excavated through its thickness to provide a foundation adapted to support a pipe position. Over-excavation will be backfilled with crushed stone type MG-20b to the levels of the culvert invert.
- .5 In the event that the Representative of Parks Canada considers that the condition of materials, which are soft or unsuitable for whatever reason, results from the Contractor's failure to adequately protect, handle and drain the worksite, or other negligence on the part of the Contractor, the latter shall, at his expense, excavate to the additional depth required of him, and fill the excavation in a satisfactory manner to the required level, even if unshrinkable fill or crushed stone is to be used, or if on the orders of the Representative of Parks Canada, other means are to be used to properly support the structure.

3.11 BEDDING AND SURROUND OF PIPES AND UNDERGROUND STRUCTURES

- .1 Generalities
 - .1 Foundation coating and culverts shall comply with requirements of the DN-III-4-002 standard drawing MTQ.
 - .2 Work involving the supply and installation of the bedding and surround for pipes and other underground structures includes the loading, transportation and disposal of resulting excavation surplus at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .2 Pipes of reinforced concrete

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- .1 The bedding shall be produced using MG-20b-type crushed stone compacted to 95 % of Modified Proctor and shall have a minimum thickness of 150 mm (6 in.) or as follows:

PIPE DIAMETER	THICKNESS OF THE BED
150 to 600 mm	150 mm (200 mm if rock)
675 to 1 200 mm	225 mm (300 mm if rock)
1 350 to 1 650 mm	300 mm
1 800 mm and over	375 mm

- .2 The central part of the cushion is non-densified over a width of $D_e/3$ and a thickness of 100 mm.
- .3 The trench is filled to half the diameter of the pipe using MG-20b crushed stone in successive layers of 150 mm maximum, mechanically compacted to a density equal to or superior to 90 % of that obtained by the Modified Proctor test over the entire width of the trench.
- .4 Filling the trench mid-diameter up to 300 mm above the pipe must be in layers not exceeding 150 mm crushed stone MG-20b Backfill compacted to 90% of modified Proctor.
- .5 Backfill simultaneously on either side of the pipe so that the thrust exerted by the ground can be canceled.
- .6 The only densifying equipment permitted are rammers, plate vibrators and vibrating drum rollers whose total applied pressure does not exceed 50 kN on the first meter over the pipe.
- .7 In the case where a concrete bed is required, the Contractor shall compact the infrastructure, with or without stone to restore its original density. Armouring, if required, is installed. The pipe is attached to pieces of wood, which will then be cast in concrete in keeping with the theoretical section shown on the plans. The filling, as previously described is only carried out once the concrete has reached a minimum strength of 15 MPa.
- .3 Geotextile
- .1 Where required by the Representative of Parks Canada, before installing the bedding stone for sanitary, storm or waterworks pipes, the Contractor shall place, on the bottom of the trench, a Texel 912 type geotextile whose width is equal to that of the trench before poses the culvert bedding.
- .2 Unless otherwise indicated on the plans or in the call for tenders documents, these standards must be met at all times.

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3.12 MAINTENANCE OF THE FILL SURFACE

- .1 The Contractor is required to keep the fill surface of trenches in good condition until the work has been accepted. Moreover, he is responsible, at all times, for accidents and damage caused to individuals, public or private property as well as vehicles. He is required to correct any sagging that might develop in the pavement and carry out all other work needed for the structure to be put into service or which might be required by the Parks Canada Representative.
- .2 In an emergency, or if the Contractor has failed to carry out repairs deemed necessary and requested via a 48 hour written notice from the Parks Canada Representative, the latter can have said work carried out by a third party, at the Contractor's expense.

3.13 LEVELS AND ALIGNMENTS

- .1 The Contractor must use a laser in every pipe and ensure the ventilation required to counter radius bend.
- .2 The Contractor shall coordinate his work to allow the Representative of Parks Canada to carry out his verifications.

3.14 TOLERANCES FOR PIPES, MANHOLES AND CATCH BASIN LEVELS

- .1 The Representative of Parks Canada checks installed pipes, based on the following tolerances

	Tolerances	
	Vertical (mm)	Horizontal (mm)
Culverts	25	100

- .2 When the level variations exceed limits indicated, the Contractor must immediately remove the pipe wrongly installed, check the preceding sections and to remove it if needed; until he finds a section acceptable, posed within the allowed limits.

3.15 BACKFILLING OF PIPES AND EXCAVATIONS

- .1 Do not start backfilling until the Parks Representative of Parks Canada and the laboratory have inspected the premises and given their authorization, and until backfill materials have been accepted by the laboratory and the Representative of Parks Canada.
- .2 Before proceeding with the backfilling of excavations, the Contractor must remove all supports from excavation walls or existing structures, as well as forms, debris, waste, etc.

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- .3 In the case of shored excavations, remove coverings as backfilling work progresses. Do not remove shoring until backfill has reached its height. Backfill shall be placed and compacted to fill all voids left by the withdrawal of the coverings.
- .4 All surfaces to be filled must be free of debris, snow, ice, water or frozen soil.
- .5 Backfill shall consist of materials from debris, excavations if they are in accordance with Article 11.6.1 of the CCDG MTQ, or with borrow materials. These materials are placed under the infrastructure line according to the plans and specifications, as well as longitudinal and cross-sectional profiles, which are part of the contract, whether or not they have been modified by the Representative of Parks Canada during the course of the work, in compliance with the requirements of the contract documents.
- .6 Materials used must comply with the article 11.6.1 of the CCDG MTQ requirements and the "Fill Materials" for the proposed use.
- .7 Fill shall be installed simultaneously on each side of the pipe or structure to cancel out pressure exercised by the ground.
- .8 Filling up off-road excavations must be done in the following manner:
 - .1 For the first meter over the pipe or other structure, the use of compacting equipment exerting more than 50 000 N of pressure is prohibited. Compacting equipment can be plate vibrators or trench rollers.
 - .2 The filling of the excavation shall use excavation surplus deemed to be reusable and free of stones measuring more than 150 mm (6 in.) in diameter, frozen material or organic matter. Voids must be filled using a finer material. The Contractor shall compact materials to 90 % of Modified Proctor, to obtain a density equal to that of the neighbouring non-reworked soil, in successive layers with a maximum thickness of 300 mm (12 in.), to the level required to restore and/or build the infrastructure of existing and/or projected elements. In the event that materials are deemed to be non-reusable, the Contractor shall use borrow materials accepted by the Parks Canada Representative. The fill shall be compacted along the entire width of the excavation.
 - .3 In the frost areaa and under the pavement infrastructure, a transition slope of 1V: 5H must be made with the existing fill material, all in accordance with the details indicated on the Drawings.
 - .4 The 150 mm (6 in.) surround layer beneath the infrastructure line shall be compacted to 95 % of Modified Proctor. The Contractor shall not spread the next layer without first obtaining the required compactness.

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- .5 For excavations located in paved zones to be preserved, the excavation and backfilling Contractor shall maintain a 1.5V:1H transition zone on the sides of the trenches for any thickness of pavement infrastructure.
- .6 New foundations and pavement must be redone in keeping with the specifications in the call for tender's documents and Drawings.
- .7 The Contractor must comply with the following requirements concerning trench backfilling:
 - .1 The backfilling is carried out by layers of 300 mm thickness maximum;
 - .2 The density obtained is checked on site by a Laboratory retained and paid by the Owner. Required density:
 - .1 Class "A" granular material: 90 % modified Proctor.
 - .2 Granular foundation and sub base: 95 % modified Proctor.
 - .3 The Contractor ensures sufficient time off to allow the Laboratory to carry out the density tests that either on bedding, sub bases or foundations.
 - .4 The cost of this work as well as excavated material transport and laying out are included in the tender.
- .9 All usable 2nd Class excavation materials belong to the Representative of Parks Canada and must be used where indicated by the Representative of Parks Canada.
- .10 If the Contractor is responsible for the loss of reusable materials, he shall be required to replace said materials, at his expense, with an equivalent volume of material acceptable to the Representative of Parks Canada.
- .11 The Contractor shall also store excavated materials, which cannot be used immediately but will be used at a later time.
- .12 In the case of excavated materials that must be set aside for later use, the cost of the double handling shall be included in the bid.
- .13 If excavated materials cannot be used, the Contractor shall dispose of them in compliance with the requirements of the article "Disposal of Excavation Surplus".
- .14 Prior to the construction of embankments, it is necessary to take into account the removal of topsoil. Furthermore, dips and voids, whether natural or resulting from the removal of obstacles, must be filled to the level of neighbouring ground, using materials of the same nature. The surface of the soil in place must be free of snow, ice and mud.

- .15 When excavated materials and excavations shown on the plans and profiles do not provide enough adequate material for the construction of embankments called for by the contract, borrow materials shall be used.

3.16 COMPACTION

.1 Generalities

- .1 The compaction of materials seeks to increase their load-bearing capacity and prevent future settlement. Compacting operations shall be carried out at an ambient temperature above 0 °C in the case of cohesive soil, and it must be above - 6 °C in the case of granular soil, with the latter compacted before materials have reached a temperature below 0 °C.
- .2 If the required compaction density is not achieved, the Contractor shall remove the excavation fill and restart compaction work using heavier equipment or increasing the number of passes. Repeat until the required compaction density has been reached.

.2 Compaction equipment

- .1 Compaction equipment must make it possible to achieve the stipulated material densities. Replace or reinforce equipment if such is not the case.
- .2 All types of standard compaction equipment, in good working order, can be used to densify various soils as stipulated. It may be necessary to add mechanical rammers, scarifiers, harrows, rotary mixers, sprinklers, etc. depending on the work to be carried out.
- .3 The Contractor must provide the Representative of Parks Canada with the characteristics of the compaction equipment he plans to use.
- .4 However, the Representative of Parks Canada reserves the right to refuse any compaction equipment that is inadequate or unsuited to local conditions, the nature of the soil and materials used.

.3 Compaction control

- .1 Compaction control is ensured by the laboratory retained by the Owner. The Contractor must notify the Representative of Parks Canada twenty-four (24) hours in advance to have the required tests carried out.

.4 Compaction levels

- .1 This article deals with the level of compaction required for the natural soil and embankments. Embankments must be erected in successive layers, compacted separately and evenly.
- .1 Compaction of the natural soil:

- .1 The bottom cut and natural soil stripped of topsoil must be densified to a depth of 150 mm, to 90 % of Modified Proctor maximum dry density. If the bottom cut or the natural soil coincides with the infrastructure line, the first 150 mm beneath the infrastructure line must be densified to 95 % of Modified Proctor.
- .2 Compaction of soil fills:
 - .1 Fill materials are densified to 90 % of Modified Proctor maximum dry density, except for the last 150 mm beneath the infrastructure line, which are densified to 95 % of Modified Proctor.
- .3 Compaction of stone fills:
 - .1 Each layer beneath the infrastructure line must be compacted using four passes of a crawler tractor weighing a minimum of 30 tons. Over the top 300 mm layer, two additional passes using a vibratory roller with a minimum static weight of 5 tons and a centrifugal force of more than 10 tons are required. In the case of friable or foliated rock, each layer must be compacted in keeping with the compaction requirement of the last 300 mm layer.
 - .2 The fill must have a minimum density of 90 % of Modified Proctor maximum dry density, except for the last 150 mm below the infrastructure line, which shall be densified to 95 %.
- .5 Optimal water content
 - .1 Add or dewater as needed to maintain the materials' required water content and thus achieve the stipulated compaction.
 - .2 The Contractor must strive to obtain, on the worksite, a water content allowing him to achieve the required density.
 - .3 The Contractor shall supply the equipment needed to accelerate the drying of overly moist soil or moisten overly dry soil.
 - .4 If the soil is too moist to allow even compaction to the required density, the Parks Representative of Parks Canada may require that the soil be mixed with dry soil or dried by aeration or scarification.
 - .5 If, on the other hand, the water content is inadequate, the Representative of Parks Canada can require watering to obtain a suitable content. The equipment required for this work is a 4 500 litre mobile tank fitted with a pressure or gravity release mechanism. The operator must be able to adjust the water distribution rate to ensure even distribution throughout the layer to be densified prior to compacting. If the surface is smooth, the Contractor shall use a scarifier or harrow to favor water penetration.
- .6 Density loss and reworking of the soil

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- .1 In the event that, before the end of the contract, the natural soil or a layer of materials already compacted according to specifications, should lose density due to the movement of equipment, poor weather, freeze-thaw cycle or any other reason, the Contractor shall be required to re-compact the soil to the required density, at his expense.

- .7 New targeted density
 - .1 When the compaction level does not meet criteria for acceptance and the Representative of Parks Canada is certain that this is not due to inappropriate operations by the Contractor or to his equipment, the Contractor can request that a new targeted density be established based on field tests:
 - .1 Establish a single field test on a uniform layer covering a surface area established on the worksite by the Representative of Parks Canada. The water content of materials tested must be close to the optimal water content (as measured using the NQ 2501-255 test method).
 - .2 Following the placement of the materials, run the compaction equipment over the full test surface six times. Determine densities and water content at three randomly selected sites. Calculate the dry density of each of the sites and use the average as the initial density value.
 - .3 Run the compaction equipment over the entire field test area two more times. Determine the densities and water content at three other randomly selected sites. Calculate a new average dry density.
 - .4 If the new average dry density does not exceed the initial value by more than 1 %, the compaction field test shall then considered to be satisfactory and complete. If the new average dry density exceeds the initial value by more than 1 %, additional runs of compaction equipment over the field test area will be conducted, in keeping with the above-mentioned procedure, until acceptance criteria have been met.
 - .5 Once compaction field tests have been completed, determine the densities and water contents at seven other randomly selected sites, then calculate the dry density at each of these sites. Calculate the average field test density based on the average of these seven values and the three final values determined by the field tests.
 - .6 The average dry density of the field tests becomes the new targeted density.
 - .7 The targeted density established based on field tests should be representative of the remainder of the layer, provided that the source and type of materials as well as the compaction equipment remain the same.

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3.17 DISPOSAL OF WASTE MATERIALS

- .1 Generalities
 - .1 The Contractor shall load, transport and dispose of all waste material off-site, at the location, which he shall select and which is suited to the disposal of said waste, in compliance with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
 - .2 Loading, transportation and disposal of waste are at the Contractor's expense.
- .2 Dry materials
 - .1 All materials from 2nd class excavation such as crushed or shredded residue, which are non-fermentable and contain no hazardous waste such as scrap wood, rubble, waste plaster, and concrete, masonry and paving refuse, shall be transported and disposed of at a dry materials dump authorized by Quebec's Ministère de l'Environnement. The Contractor must provide the Representative of Parks Canada with proof that the selected dumpsite meets the requirements of this article as well as receipts issued by the dumpsite upon reception of the material. The cost of sorting, handling and disposing of these materials shall be assume/ by the Contractor.
 - .2 Materials from the deforestation and clearing of the zone affected by the work (such as trees, shrubs, bushes, branches, brush, stumps, dead wood, and other vegetation waste and materials containing demolition debris) or from the demolition of existing pavement, curbs, and sidewalks or existing underground installations, shall be disposed of at a site authorized for dry materials. The cost of sorting, handling and disposing of these materials shall be assumed by the Contractor.
- .3 Unusable materials
 - .1 All materials from 2nd class excavation and deemed unusable by the Representative of Parks Canada, such as putrid matter, topsoil, loam, etc., shall be transported to a suitable location chosen by the Contractor and approved by the Representative of Parks Canada. Rotting materials from debris will also be loaded into closed truck boxes. The cost of sorting, handling and disposing of these materials shall be assumed by the Contractor.
 - .2 If deemed necessary by the Parks Representative of Parks Canada, the Contractor shall, for filling trenches, replace unusable materials with acceptable materials.

3.18 DISPOSAL OF EXCAVATION SURPLUS

- .1 Excavation surplus refused by the Representative of Parks Canada for the project's backfilling purposes can be disposed of at a site selected by the Contractor and approved by the Parks Canada Representative, and located at least 75 m (250 ft.) from a road's right-of-way or the shoreline of a water course. Materials must be placed so as not to be visible from a public road or obstruct the flow of water. Once disposal has been completed, the materials must be leveled to the satisfaction of the owner(s) of the land. The Contractor must obtain a letter of authorization from each of the owners of the land covered by these provisions. A copy of this agreement must be provided to the Representative of Parks Canada before material is transported.
- .2 All work covered by the preceding provisions shall be carried out in compliance with the directives and/or regulations of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy, which, in the event of contradiction, take priority over the preceding requirements.
- .3 All expenses related to any use whatsoever of the above-mentioned disposal and/or landfill site, including the obtention of any permit and/or authorization, as well as the loading, transportation and disposal, shall be at the Contractor's expense.
- .4 All sites for the storage and disposal of debris (excavation surplus excluding any refuse) considered within the framework of this contract must first be approved by the Representative of Parks Canada no later than the first worksite meeting. None of these materials can be disposed of until this approval has been obtained.
- .5 Part of the debris is used by the Contractor to carry out work covered by this contract. If excavation surplus is required by the Owner, the Contractor shall transport and spread this surplus material at his expenses, at designated locations within an overland radius of 8,0 km, as established by the Owner.
- .6 All excavation surplus and 1st and 2nd class debris not required by the Owner become the property of the Contractor.
- .7 The Contractor shall ensure that these materials are not disposed of in a flood zone and, prior to the start of the work, shall provide the Owner with a permit.
- .8 The Contractor is solely responsible for consequences resulting from the filling of one or more properties and possible claims or lawsuits from the property owners concerned, with regards to the levelling, the quality of debris materials, damages to trees, terraces, etc. The disposal of excavation surplus must not impede the natural drainage of the site.

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3.19 ACCESS ROADS

- .1 Put in and maintain suitable roads providing access to the worksite.
- .2 The Contractor shall restore land used as an access road to its original condition.

3.20 EROSION AND SEDIMENTS CONTROL METHODS

- .1 The Contractor must set up temporary methods against erosion and deposit of sediments deposit as fences or sediments barriers as shown on plans and as request by the Representative of Parks Canada, according to plans. Connecting two lengths of fence must be done according to the details on plans.
- .2 The Contractor must inspect the controlling methods set up, ensure maintenance and repair them when needed until the permanent vegetation is well established.
- .3 The Contractor must remove the control methods at the appropriate time, restore the site and stabilize the surfaces stirred up during this work

3.21 RESTORATION WORK

- .1 Once work on the project has been completed, remove surplus materials and debris, trim slopes and correct defects identified by the Representative of Parks Canada.
- .2 Clean and restore areas damaged by the work, as directed by the Parks Canada Representative.
- .3 Unless otherwise indicated, the ratio of embankment slopes will not be less than 1 V : 1.5 H.

END OF SECTION

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Part 1 General

1.1 RELATED SECTIONS

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|----|------------------------------------|------------------|
| .1 | Civil - Generalities | Section 31 00 00 |
| .2 | Civil - Excavation and Backfilling | Section 31 23 11 |

1.2 SCOPE OF WORK

- .1 The work shall include, but not be limited to, supplying the materials and manpower required for the execution, according to good engineering practices, of the environmental management and disposal of excavation surplus, in compliance with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy and prevailing municipal by-laws. Also included:
- .1 Lifting of samples by a recognized environmental firm,
 - .2 Chemical analysis of these samples by a laboratory accredited by the MDDEP,
 - .3 The borehole rate is 1/625 m²,
 - .4 The sample rate is 1 per horizon encountered in the boreholes,
 - .5 Parameters to be analyzed will be: PAH, PH C10-C50, metals (13 elements),
 - .6 The excavation, loading, transportation and disposal of excavation surplus to a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy,
 - .7 The manual segregation and temporary storage of waste contained in excavated materials,
 - .8 If required, the installation of temporary piles, including the polythene fabrics of 6 mils covering the piles,
 - .9 The disposal of excavated contaminated soil on authorized sites or their transportation for reuse as directed by the Representative of Parks Canada.,
 - .10 Supply of the weighing of each enumerated range and the weighing machine calibration certificate,
 - .11 The surveying of work zones, excavation boundaries and bottoms, and restored zones,
 - .12 Cleaning of each truck's box,
 - .13 Providing the permits and documents attesting the site's compliance to MDDEFP,
 - .14 All other work required for the complete production of these structures.

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- .2 The quantities presented at the item "Environmental Management of excavation surpluses" represent only a provision. The Contractor will be remunerated according to the quantities really carried out by the unit price of the tender.

Part 2 Products

2.1 MANAGEMENT OF CONTAMINATED SOIL

- .1 The environmental management of excavation surplus includes the lifting of soil samples by a recognized environmental firm and the chemical analysis of these samples by a laboratory accredited by the MDDEFP.
- .2 Parcels of land to be decontaminated and estimated volumes of the different materials to be excavated were established during the environmental site assessment and are presented in the report on the geotechnical study carried which is attached to the contact documents.
- .3 The Contractor shall lift one sample per 625 m². He must lift and analyze one sample per horizon encountered in the borehole[s]. The location of the boreholes shall be determined by the Departmental Representative on the work site.
- .4 For each sample, the Contractor shall have an analysis conducted for the following parameters:
- .1 Petroleum hydrocarbons (C10-C50),
 - .2 Polycyclic aromatic hydrocarbons (PAH),
 - .3 Metals (13 elements).
- .5 Results obtained shall be compared with the generic contamination criteria of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .6 Excavation materials below criteria A and excavation materials within the A-B range can be reused as excavation fill, providing they comply with the previously listed criteria.
- .7 Excavation materials within the A-B that could not be re-used as backfilling materials in this project must be disposed of at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .8 Excavation materials within the B-C range must be disposed of at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .9 Excavation materials above the criteria C must be disposed of at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.

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- .10 The Contactor shall carry out sampling and analyses at least one week prior to any excavation work, since no excavation work can be authorized until results have been transmitted to the Representative of Parks Canada.

Part 3 Execution

3.1 DISPOSAL OF CONTAMINATED EXCAVATION MATERIALS

- .1 The Contractor must refer to la section 31 23 11 - Civil - Excavation and Backfilling -

3.2 ABBREVIATIONS AND DEFINITIONS

- .1 Generalities
- .1 Should contaminated materials be detected during construction, these excavated materials shall be managed and disposed of in compliance with prevailing environmental and municipal regulations.
- .2 Abbreviations and definitions
- .1 Waste: Refers to any material to be excavated by the Contractor, which corresponds to definitions contained in the Regulation respecting solid waste or the Regulation respecting hazardous materials, administered by Quebec's MDDEFP (Ministry of Sustainable Development, Environment, Fauna and Parks).
- .2 Soil to be excavated: Refers to any soil that must be excavated by the Contractor at locations and depths determined by the Owner.
- .3 A-B Soil: Refers to soil whose contamination concentrations fall within the A-B range as defined by the generic criteria of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .4 B-C Soil: Refers to soil whose contamination concentrations fall within the B-C range as defined by the generic criteria of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .5 >C and < Soil : Refer to soil whose contamination concentrations exceed generic C criteria as defined by the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy and falls below the standards of the Regulation respecting the burial of contaminated soils.
- .6 Soil whose chemical and geotechnical characteristics are acceptable: Refers to soil from restoration work, which has been temporarily stored on the site itself or on an outside site, whose components are mineral in nature and whose contamination concentrations do not exceed permissible levels shown in the Table for the Management of Contaminated Excavated Soils included in the MDDEFP's Soil Protection and Contaminated Sites

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Rehabilitation Policy, in compliance with this section's "Backfilling Materials" article.

3.3 TEMPORARY STORAGE

- .1 It is important to note that the work site shall be used for the temporary storage of piles of excavated soil. Debris must never be piled more than 1 meter in height, to ensure the establishment's visibility and security, except occasionally within a single work day.

3.4 LEGISLATION

- .1 The Contractor must carry out all soil and groundwater restoration work in compliance with the following guides, guidelines, standards and regulations:
 - .1 MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
 - .2 MDDEFP's guides and guidelines.

3.5 EXCAVATION OF CONTAMINATED SOIL

- .1 Should contaminated soil be encountered, the Contractor shall conduct excavation work in a methodical fashion, which provides the control required for environmental follow-up. He shall carry out selective excavations, as directed by the Representative of Parks Canada.
- .2 The Contractor must consider that the Representative of Parks Canada must be present throughout the duration of excavation work and that the latter can, at any time, stop work in a sector to carry out observations, samplings and analyses. The Contractor shall provide all collaboration required for the smooth execution of the work, to ensure that all contaminated soil is removed and disposed of in an adequate manner. In this regard, it is possible for changes to occur and for the elevations of contaminated soil to be excavated be modified as excavation work progresses.

3.6 MANAGEMENT OF EXCAVATED MATERIALS

- .1 When required, excavated soil shall be temporarily stored on polyethylene tarps. Soil shall also be covered with a polyethylene tarp. Tarps must be of "Extra Strong" calibre, 6 mils thick and well anchored.
- .2 Debris must never be piled more than 1 m in height, to ensure the establishment's visibility and security, except occasionally within a single work day.

3.7 SAFETY

- .1 The Contractor must, at his own expense, prevent excavations from collapsing. To this end, he must maintain stable slopes required for the proper execution of the work and the protection of workers on the jobsite.

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- .2 The Contractor shall take measures needed to ensure that the piles of materials as well as the work do not impeded traffic and transportation. He must use a work method that allows him to confine contaminated soil to specific areas, in order to limit the risk of contaminating clean zones.

3.8 DISPOSAL OR TREATMENT OF CONTAMINATED SOIL

- .1 Contaminated soil, which cannot be reused as fill material on the site, shall be shipped for disposal or treatment to an authorized site. Weight tickets given to the driver by the treatment or disposal site shall be handed to the Representative of Parks Canada.
- .2 Truck boxes shall be fitted with removable hoops and watertight tarps firmly secured to the walls.

END OF SECTION

PART 1 - GENERALITIES

1.1 RELATED SECTIONS

.1	Civil - General	Section 31 00 00
.2	Civil - Excavation and Backfilling	Section 31 23 11
.3	Civil – Culverts	Section 33 31 00
.4	Civil – Topsoil and Finish Earthwork	Section 32 91 21

1.2 EXTENT OF WORK

- .1 Supervise work and provide all labour, equipment, tools, materials, transportation and other services required to execute and complete all work described and specified in the present section and in the contract documents, including but not limited to: providing, laying and compacting aggregates necessary for the construction of one or more aggregate base courses and the supply and laying of one or more layers of asphalt concrete mixed in a central plant and laid over an aggregate surface, in all cases in compliance with the lines, thicknesses, levels and profiles indicated on the contract drawings or as specified by the Representative of Parks Canada.

1.3 REFERENCES

- .1 Bureau de normalisation du Québec (B.N.Q. – Quebec standards office).
- .1 NQ 2501-255/2005 : Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2700 kN.m³). [Soils – Determination of wet density – test with modified compacting energy]
- .2 Ministère des Transports du Québec (Quebec transportation department, hereafter MTQ)
- .1 Cahier des charges et devis généraux du Ministère des Transports du Québec, édition 2003. [General specifications]
- .1 Section 13 - Revêtement de chaussée en enrobé. [Pavement with asphalt mixes]
- .2 Cahiers des Normes, Ouvrages Routiers, vol. I “Conception routière”, most recent edition. [Road construction standards – design]
- .3 Cahiers des Normes, Ouvrages Routiers, vol. VII “Construction routière”, most recent edition. [Road construction standards – construction]
- .4 Cahiers des Normes, Ouvrages Routiers, Tome VII « Matériaux », dernière édition.
- .1 Standard 2101 - Granulats. [Aggregates]

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- .2 Standard 2102 - Matériaux granulaires pour fondation, sous-fondation, couche de roulement granulaire et accotement. [Aggregates for base course, subbase, aggregate surface course and shoulder]
 - .3 Standard 4101 - Bitumes. [Asphalts]
 - .4 Standard 4105 - Émulsions de bitume. [Bituminous emulsions]
 - .5 Standard 4201 - Enrobés à chaud formulés selon le principe de la méthode Marshall. [Hot mix asphalts mixed using Marshall method principles]
 - .6 Standard 10201 - Peinture à alkyde pour le marquage des routes. [Alkyd paint for road markings]
 - .7 Standard 13101 - Géotextiles. [Geotextiles]
 - .8 Standard 14601 - Microbilles de verre pour peinture servant au marquage des routes. [Glass micro-beads for road-marking paint]
- .5 Cahiers des Normes, Ouvrages Routiers, Tome VIII « Dispositifs de retenue », most recent edition. [Road construction standards].

1.4 WORK PERFORMED BY OTHER COMPANIES OR CONTRACTORS

- .1 Where applicable, the Contractor must coordinate its work with that of any other Contractor, company or public utility that needs to perform work of any nature whatsoever, before or during the period of work covered by the present contract.

1.5 INSPECTION AND TESTING

- .1 Analyses and tests of materials and compacting work are to be done by a testing Laboratory designated by the Owner.
- .2 The Owner shall pay said Laboratory's inspection and testing fees. If any tests must be repeated due to the discovery of non-conformities, the tests must be repeated at the Contractor's expense.
- .3 Granulometric analysis: fill materials are tested to determine if they are suitable for their intended use and compliant with specifications.
- .4 Wet density analysis: tests are performed on the compacted material in accordance with standard NQ 2501-255 Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2700 kN.m³). [Soils – Determination of wet density – test with modified compacting energy]
- .5 Compaction tests
 - .1 The Owner reserves the right to have compaction tests performed in order to verify that specified compactness has been reached. The Contractor shall assist in the performance of such tests and may not claim

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compensation for work stoppages or other losses of time resulting from performance of such tests.

- .6 The frequency of tests is defined by the Representative of Parks Canada or according to the following procedure:
- .7 The same Laboratory shall provide the Representative of Parks Canada with progressive reports confirming that it has performed all tests ordered and that the test results are consistent with the plans and specifications. In addition, the Laboratory must provide the Representative of Parks Canada with a final report confirming that all fill material is consistent with the plans and specifications and that no laying of concrete or pavement was authorized before delivery of the report.
- .8 If the Contractor uses a fill material other than that sampled for testing, all fill material must be removed and replaced at the Contractor's expense.

1.6 LABORATORY

- .1 At the Representative of Parks Canada request, a Laboratory will be present on-site to perform qualitative tests on materials and to monitor their placing.
 - .1 In situ density test and other qualitative tests
 - .1 In the case of in situ density tests and other qualitative tests performed to verify the compaction of the infrastructure or of aggregate fills, the cost of the first test performed for acceptance of a layer of material in a given zone shall be covered by the Owner.
 - .2 However, if the results of such tests show the work not to be compliant with the standards listed in the specification, the Contractor must complete the repairs or take other necessary actions. Further in situ density tests shall then be at the Contractor's expense.

1.7 DOCUMENTS TO BE SUBMITTED

- .1 Asphalt must meet the specifications of MTQ standard 4101. Asphalt shall be sampled at the production facility before work commences.
- .2 Submit test results and the certificate issued by the manufacturer attesting that the bituminous binder to be used meets the requirements of the present section.
- .3 Submit to the Representative of Parks Canada for approval the proportioning formula for the asphalt concrete mix together with test results for the mix, at least two (2) weeks before the beginning of work.

1.8 DELIVERY TICKETS

- .1 Each load delivered to the site shall be accompanied by a delivery ticket in duplicate. The Representative of Parks Canada representative must sign one copy as a receipt for the Contractor and keep the other copy.

1.9 PAVED ROAD

- .1 Work involving paved roads involves, without being limited to, providing the materials and labour required to complete, in a manner consistent with industry standards, the construction of a road, including:
 - .1 Saw cuts in the existing pavement to keep,
 - .2 Planning of existing pavement on the distance required for connecting the asphalt,
 - .3 Excavation of the existing materials to the subgrade line required,
 - .4 The loading, transportation and disposal of excavation waste in a site compliant with the stipulations of the Soil protection and rehabilitation of contaminated sites policy (Quebec department of environment, sustainable development and parks, hereafter MDDEFP),
 - .5 Supply and placing of fill material approved by the Representative of Parks Canada,
 - .6 The reconstruction of the cross section of the road including the platform road shoulders, the extra width of the shoulder for the installation of retaining devices used, the slope,
 - .7 Supply and installation of geotextile membrane, if required,
 - .8 Supply and laying of subbase and base course as specified in the plans and specifications,
 - .9 Supply and laying of layers of asphalt coating, base and surface courses, as specified in the plans and specifications,
 - .10 Supply and application of the tack coat.

1.10 ROAD MARKINGS

- .1 Road-marking work involves, without being limited to, providing the materials and labour required to complete, in a manner consistent with industry standards, marking of the road as specified in the plans and specifications, including:

- .1 Supply and application of paint and reflective glass micro beads in compliance with the marking plans, and all related work including cleaning of surfaces prior to marking, if necessary.

1.11 REMOVAL OF EXISTING GUARD RAILS

- .1 Work involving the removal of existing guardrails involves, without being limited to, providing the materials and labour required to complete, in a manner consistent with industry standards, the removal of existing guardrails, including:
 - .1 Excavation and site preparation and the loading, transportation and disposal of excavation waste and debris in a site compliant with the stipulations of the Soil protection and rehabilitation of contaminated sites policy (MDDEFP),
 - .2 The removal of existing guard rails in the trenching area, and taking the necessary precautions to avoid damaging the rails and transportation of the materials to locations designated by the Representative of Parks Canada,
 - .3 Levelling of the ground and blending with adjacent surfaces,
 - .4 The protection of existing guard rails to maintain,
 - .5 Cleaning of the site and removal of unusable material.

1.12 INSTALLATION OF NEW GUARDRAILS

- .1 Work for new guardrails involves to provide the materials and labour required to complete, in a manner consistent with industry standards, the construction of new fences and barriers, including:
 - .1 Excavation and site preparation and the loading, transportation and disposal of excavation waste in a site compliant with the stipulations of the Soil protection and rehabilitation of contaminated sites policy (MDDEFP),
 - .2 Supply and installation of posts and flexible guardrails,
 - .3 Levelling of the ground and blending with adjacent surfaces,
 - .4 Cleaning of the site and removal of unusable material.

1.13 SHOULDERS TO SHOULDER AND OVERWIDTH

- .1 Shoulder construction involves, without being limited to, providing the materials and labour required to complete, in a manner consistent with industry standards, the construction of a shoulder, including:
 - .1 Excavations to the required level,

- .2 The reconstruction of shoulders and extra width of the shoulder for the installation of retaining devices,
- .3 The loading, transportation and disposal of excavation waste in a site compliant with the stipulations of the Soil protection and rehabilitation of contaminated sites policy (MDDEFP),
- .4 Supply and placing of fill material approved by the Representative of Parks Canada,
- .5 Supply and installation of geotextile membrane, if required,
- .6 Supply and laying of aggregates for the shoulder, as detailed in the plans and specifications.
- .7 Levelling of the ground between the shoulder and the limit slope.

1.14 GEOTEXTILES

- .1 Geotextile work comprises the supply of all materials, labour and equipment required for the installation of geotextile membranes, and also includes any loss of material for overlapping during installation of the membrane; in other words, the Contractor is paid by the theoretical square metre of surface to be covered by the geotextile membrane.

1.15 DITCHES

- .1 Work on ditches includes:
 - .1 Excavation (1st and 2nd classes),
 - .2 Loading, transportation, disposal and levelling of excavated material,
 - .3 Shaping to match the typical cross-section,
 - .4 Connections to existing ditches, sewers or manholes,
 - .5 Stabilisation slopes, if specified on the plans,
 - .6 Restoring the site to good condition.

1.16 PLANING

- .1 The work consists of leveling, but are not limited to, providing equipment and labor necessary for the completion of work, according to the rules of art, leveling specified plans including surfaces;
 - .1 The flattening of an asphalt layer 50 mm thick on the existing pavement width specified plans,
 - .2 Loading, transport and disposal of waste and surplus excavation site to comply with the directives of the policy of soil protection and rehabilitation of

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- contaminated land MDDEFP,
- .3 All other work necessary for the full implementation of these works.

PART 2 - PRODUCTS

2.1 GEOTEXTILE MEMBRANE

- .1 Geotextiles extended the infrastructure must be of type V satisfy the requirements of Department of Transportation. In addition, they must resist puncturing of bred stones.

2.2 AGGREGATES FOR SUBBASE AND BASE COURSE

- .1 Aggregates used for the subbase and base course must meet the requirements of MTQ standards 2101 and 2102 and those of section 31 23 11 - Civil - Excavation and Backfilling.

2.3 ASPHALT MIXES – HOT PREPARATION AND LAYING

2.3.1 Definitions

- .1 Asphalt mixes: An asphalt mix prepared and laid hot is a combination of new aggregates and bitumen, mixed hot in a mixing plant and designed to be laid while hot.
- .2 Internal quality control: Quality control done by the Contractor responsible for supplying asphalt mixes.
- .3 External quality control: Quality control done by an organization independent of the Contractor and paid by the Owner.
- .4 Internal control tracking: Tracking of the Contractor's internal control results by the external control process.
- .5 Process audits: Within a specific project, documented audit of the asphalt mix production process and of the implementation of quality management activities described in the Contractor's quality manual and in the quality plan and the control and testing plan.
- .6 ISO 9002: Standard that defines minimum requirements for a quality system.
- .7 Reclaimed asphalt pavement: Asphalt that has been reclaimed either by milling or by in situ pulverization.

2.3.2 Reference standards

- .1 Hot mix asphalts must be compliant with the requirements indicated in the plans and specifications and with applicable standards from the MTQ's standard for road construction and maintenance (vol. VII - Matériaux des normes de constructions et d'entretien routiers). The applicable edition is the most recent as of the signing of the contract documents. The standards are:
 - .1 Standard 2101: Granulats [Aggregates]
 - .2 Standard 4101: Bitume [Asphalts]
 - .3 Standard 4201: Enrobés à chaud formulés selon le principe de la méthode Marshall [Hot mix asphalts formulated using the Marshall method]
 - .4 Standard 4202: Enrobés à chaud formulés selon la méthode de formulation du Laboratoire de chaussées [Hot mix asphalts formulated using the Laboratoire des chaussées (Quebec pavement laboratory) method]

2.4 CONSTITUENTS

2.4.1 Asphalt

- .1 Specifications
 - .1 The required characteristics and evaluation criteria for asphalts are found in MTQ standard 4101.
 - .2 The performance class of asphalts is defined by the expression PG H L, i.e.:
 - .1 PG: Performance Grade;
 - .2 H: temperature (in °C) above which the asphalt is likely to experience irreversible deformations;
 - .3 L: temperature (in °C) below which the asphalt is likely to crack due to thermal contraction.
 - .3 The performance class to be used is indicated in the specification. Class PG 58-34 is used for pavement.
- .2 Quality assurances
 - .1 All asphalt used for producing asphalt mixes must be produced by a Producer holding an ISO 9002 compliant quality certification (Quality system - model for quality assurance in production, installation and servicing).

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- .2 For each delivery of asphalt, the asphalt-mix Producer must obtain a certification of compliance from the asphalt Producer containing the following information:
 - .1 General information:
 - .1 Identification of the Producer and place of production;
 - .2 Performance class of the asphalt;
 - .3 The lot number;
 - .4 Production date.
 - .2 Characterization tests:
 - .1 Date of asphalt characterization;
 - .2 All tests in table 4101-1 of standard 4101.
 - .3 Control tests:
 - .1 Date of test;
 - .2 DSR (AASHTO TP 5) tests on the source asphalt:
 - .1 The high characterization temperature (T_e)
 - .3 BBR (AASHTO TP 1) tests on the source asphalt:
 - .1 Stiffness value - S_o ;
 - .2 Slope – m value.
 - .4 Recommendations – service temperatures
 - .1 Minimum and maximum storage temperatures;
 - .2 Minimum and maximum mixing temperatures⁽¹⁾;

(1) A range of 14°C is allowed for mixing. The interval is determined by applying a tolerance of $\pm 7^\circ\text{C}$ to the optimal mixing temperature corresponding to a viscosity of 0.17 Pa-s. This temperature is determined using the MTQ's LC 25-007 testing method. In the event that this calculation yields a maximum mixing temperature above 170°C, the maximum mixing temperature is set at 170°C and the minimum at 156°C.

2.4.1.1 Aggregates

- .1 Aggregates used for preparation of asphalt mixes must be compliant with the requirements of MTQ standard 2101.
- .2 For asphalt mixes formulated according to the Marshall method, aggregates must additionally meet the requirements of MTQ standard 4201. However, the polishing-by-projection coefficient requirement (LC-21-102) does not apply.

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- .3 For asphalt mixes developed using the Laboratoire des chaussées method, aggregates must additionally meet the requirements of MTQ standard 4202.
- .4 Intrinsic and manufacturing characteristics are indicated in the contract documents. If omitted from these documents, the following characteristics apply:

TABLE - AGGREGATES

TYPE OF PAVEMENT	AGGREGATE SIZE	INTRINSIC CHARACTERISTICS CATÉGORIE	MANUFACTURING CHARACTERISTICS CATEGORY
Local traffic, no buses	Coarse	2	A
	Fine	2	
All others	Coarse	2	A
	Fine	1	100% fractured

- .5 Unless otherwise specified in the contract documents, fine aggregates must consist of manufactured sand or a combination of natural and manufactured sand, and coarse aggregates must be crushed quarried rock.

2.4.2 Hot mix asphalt

- .1 Hot mix asphalts must be produced in compliance with MTQ standards 4201 and 4202. The asphalt mixes must be produced by a firm operating a mixing plant registered by a registrar accredited by the Standards Council of Canada or a recognized certifying body attesting that the Producer has a quality system compliant with ISO 9002 "Quality system - model for quality assurance in production, installation and servicing."
- .2 Reclaimed asphalt concrete, coarse and fine aggregates containing scoria and/or blast furnace residues must not be used in any asphalt mix.

2.4.2.1 Resistance to rutting

- .1 Requirements for rutting resistance of asphalt mixes as presented in tables 4201-1 and 4202-1 of MTQ standards 4201 and 4202 apply when the asphalt used is performance grade PG 64-34.

2.4.2.2 Presentation of formulas

- .1 The theoretical formula for the hot mix asphalt must be signed and dated by the Producer's quality control manager and supplied at least one week before delivery of the hot mix asphalt. One theoretical formula per type of asphalt mix must be produced for each type of binder or each change in aggregate supply. The characteristics given in the formula must be representative of the hot mix asphalt to

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be placed and compliant with the requirements of the applicable standard, specifically MTQ 4201 for hot mix asphalts formulated using the Marshall method and MTQ 4202 for hot mix asphalts formulated using the MTQ Laboratoire des chaussées method. The percentage of air voids in the mix to be produced from a formula must be 3 to 4%.

- .2 Each year, when starting up production, the Producer must perform an in-process evaluation of the formula as presented. The evaluation of the asphalt mix formula is made from the results of tests done by the Producer on five samples drawn from a representative production run. Two reference samples must be taken at the time of in-process testing, and the Producer must advise the Engineer of the date and place of the sampling, to which the Engineer may send a representative. The list of tests required for evaluation of the formula is presented in Appendix 1.

2.4.2.3 Main characteristics

- .1 In addition to meeting the requirements of the present specification, a lot is considered compliant following external control testing if, for the main characteristics, the deviation between the average results obtained for samples taken from the lot and the formula is within acceptable deviations (E_t) indicated in the following table:

TABLE – MAIN CHARACTERISTICS

ACCEPTABLE AND CRITICAL DEVIATIONS FROM THE FORMULA					
Main characteristic	E_t for N = 1	E_t for N = 2	E_t for N = 3	E_t for N = 4	E_t for N = 5
% passing through the 80 μ m screen - All mixes	1.7	1.2	1.0	0.9	0.8
<u>Granulometric total</u>					
- EB-20, EB-14, ESG-14	40	30	24	21	19
- EB-10S, EB-10C, ESG-10, EG-10	30	22	18	16	14
Bitumen content - All mixes	0.45	0.38	0.31	0.27	0.24
Compactness					
- EB-20	4.0	1.6	1.2	1.1	0.8
- EB-14, ESG-14, EB-10S, EB-10C, ESG-10, EG-10	4.0	1.6	1.4	1.3	1.0

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* N = Number of samples

Note 1 For compactness, acceptable and critical deviations are applied to the minimum requirement of 92%.

Note 2 Acceptable and critical deviations apply to the mean value for the lot as compared to the formula.

Note 3 The values of the deviations indicated are expressed as percentages.

2.4.2.4 Percentage air void

- .1 A lot will be considered compliant if the percentage of air voids as established by standard LC 26-320 deviates less than 1.5% from the final asphalt mix formula.

2.4.2.5 Correction factor

- .1 No correction factor will be applied. If a lot does not comply with previous table, it will be rejected. The Contractor shall at his own expense remove all wrapped up this lot if it is already set up and start paving again to respect the differences allowed.

2.4.2.6 Other characteristics

- .1 Hot mix asphalt formulated using the Marshall method
 - .1 For hot mix asphalt formulated using the Marshall method (MTQ standard 4201) to be compliant, it must also meet the following criteria:
 - .1 In results of analysis for the first screen, in which retained material is permitted, the percentage of material passing through the screen must not be under the minimum requirement indicated in table 4201-1 of MTQ standard 4201 by more than 3%, and the requirement of 100% of material passing through the next largest screen must be met as stipulated in the same table;
 - .2 The values of physical characteristics (% air voids, asphalt film and filled VMA) presented with the formula must be targeted or met;
 - .3 In the event that one of these criteria is not met, each sample that failed to meet one or more criteria is to be analyzed separately for compliance with the requirements of table 4201-1 of MTQ standard 4201 in order to identify the source of bias;
 - .4 All asphalt mixes that do not meet the requirements stated in the plans and specifications shall be deemed defective, and the Representative of Parcs Canada reserves the right to reject the work and have it re-done by the Contractor.
 - .2 Hot mix asphalt formulated using the MTQ Laboratory method

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.1 For hot mix asphalt formulated using the Laboratory method (MTQ standard 4202) to be compliant, it must also meet the following criteria:

.1 In results of analysis for the first screen, in which retained material is permitted, the percentage of material passing through the screen must not be under the minimum requirement indicated in table 4202-1 of MTQ standard 4202 by more than 3%, and the requirement of 100% of material passing through the next largest screen must be met as stipulated in the same table;

.2 The percentage of "Marshall" voids exceeding 1.0% or deviating more than 1.5% from the average % of "Marshall" voids obtained during the in-process analysis of the theoretical formulas and the establishment of final formulas must be targeted or met;

or

The percentage of voids indicated in table 4202-1 of MTQ standard 4202 for each number of gyrations in a gyratory shear compactor is targeted or met.

In the event that one of these criteria is not met, each sample that failed to meet one or more criteria is to be analyzed separately for compliance with the requirements of table 4201-1 of MTQ standard 4201 in order to identify the source of bias, and the Representative of ParKs Canada reserves the right to reject the work and have the work re-done by the Contractor.

All asphalt mixes that do not meet the requirements stated in the plans and specifications shall be deemed defective.

2.4.3 Types of asphalt mixes

- .1 All asphalt mixes must resist rutting. Rutting resistance tests must be performed in compliance with MTQ standard 4201, in particular table 4201-1.
- .2 The Contractor must supply a data sheet showing that the asphalt mixes are resistant to rutting.

2.4.4 Acceptance inspection of pavement compactness and thickness

- .1 This section does not apply to asphalt mixes used for patching or for correction before laying of the surface course.
 - .1 Verification of compactness using radiation-type densimeter
 - .1 The Owner verifies the compactness of asphalt pavement using a radiation-type densimeter.

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.2 Calibration of densimeter

- .1 For each mixing plant, the densimeter to be used is calibrated using the procedure defined in standard ASTM D 2950, "Standard test method for density or bituminous concrete in place by nuclear methods" or by comparison of densimeter results and core sample densities, done at least once per year per type of asphalt mix using an average of at least six core samples in order to correct the density reading obtained with the device.

2.5 TACK COAT

- .1 The tack coat is a fast-curing RS-1 type bituminous emulsion. The tack coat must meet the requirements of MTQ standard 4105. Supply of the tack coat must meet the requirements of the MTQ's general specifications (CCDG).

2.6 PROPORTIONING FORMULA

- .1 The proportioning formula shall be supplied by the Contractor and approved by the Representative of Parks Canada.
- .2 The proportioning formula must be developed by a testing Laboratory approved by the Representative of Parks Canada.
- .3 The formula cannot be modified without the approval of the Representative of Parks Canada. If the source of material changes, a new proportioning formula must be approved by the Representative of Parks Canada.

2.7 LIQUID DUST-CONTROL AGENT

1. When vehicles must drive on an aggregate surface and weather conditions cause excessive dust to be raised, hindering traffic and harming the environment, the Engineer may request that the surface be treated with a liquid dust-control agent consisting of a calcium chloride (CaCl_2) solution.
- .2 The agent is to be applied to a levelled, prepared surface.
- .3 The calcium chloride solution, which must be 35% by weight, is applied under pressure in one or two applications at the rate of 1.0 L/m^2 unless otherwise indicated.
- .4 The aqueous calcium chloride solution must meet the requirements of standard NQ 2410-001 "Solution aqueuse de sels inorganiques utilisée comme abat-poussière" [Aqueous solution of inorganic salts used as dust-control agents].
- .5 The Contractor shall ensure that the specified application rate is respected. No application is to be made during rain or on an excessively damp surface.

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- .6 If necessary, the Representative of Parks Canada may verify the compliance of the product. Sampling of the material on site is done from the spreader tank according to standard ASTM-D260, and analysis of the aqueous solution is done using the Solvay 832-A method or by densimetry. The samples are used for determining the quality and concentration of CaCl_2 in the solution. Solutions must be applied using a spreader with spray bar fitted with accessories appropriate to the work such as a tachometer, pump, pressure gauge and spray bar with jets and sprinklers.
- .7 Application of liquid calcium chloride includes purchase, transportation, application and all other incidental expenses.

2.8 ROAD MARKINGS

2.8.1 Quality of paint

- .1 The paint used for painting markings must meet the requirements of MTQ standard 10201 "Peinture alkyde pour le marquage des routes" [Alkyd paint for road markings] from the general standards (CCGD), most recent edition. The only products that will be considered are those previously approved via the most recent MTQ central laboratory call for tenders.

2.8.2 Data sheet

- .1 At the first site meeting, the Contractor must provide the Representative of Parks Canada with the paint manufacturer's data sheets, certifying compliance of the product. The data sheet must include full identification of the product, including:
 - .1 Manufacturer's name and address;
 - .2 Name of the product;
 - .3 Product code;
 - .4 The reference to MTQ standard 10201;
 - .5 Manufacture date;
 - .6 The colour and its code;
 - .7 The product's physical and chemical characteristics;
 - .8 Storage conditions;
 - .9 Instructions for pavement preparation;
 - .10 Methods and conditions of application specified by the manufacturer.

2.8.3 Paint manufacture date

- .1 All paint used for road markings must be from a batch produced not more than three (3) months before the date of application.

2.8.4 Safety sheet

- .1 Barrels must be labelled in compliance with standards for the identification of hazardous materials.

2.8.5 Materials

- .1 The Contractor must have at its disposal the required and appropriate materials for painting each type of line. The Representative of Parks Canada reserves the right to verify equipment, tools, materials, or employees scheduled to do the work at any time before or after acceptance of the agreement and to reject any inadequate or non-compliant device and/or any vehicle in poor condition.
- .2 Spray guns must have a minimum pressure of 550 kPa.

2.8.6 Micro beads for painting

- .1 Micro beads must meet the following standards: BNQ 3820-200 and BNQ 3702-600 "Microbilles de verre pour peinture servant au marquage des routes" and MTQ 14601, "Microbilles de verre pour peinture servant au marquage des routes" [Glass micro beads for road markings].
- .2 Micro beads are to be used for centre lines, stop lines, crosswalks and arrows. The rate of application of glass beads shall be 0.6 to 0.7 kg per litre of paint. Application of micro beads must be done mechanically and on the entire painted surface.

2.8.7 Application of paint

- .1 The Contractor shall apply the paint using a spray gun at the rate of 0.56 mm thick \pm 0.04 mm (wet film) and apply the glass micro beads on wet paint at the rate of 0.6 to 0.7 kg/litre of paint. The method of micro bead application must be approved by the supervisor.
- .2 Following application, fresh paint shall be protected by markers or cones for a minimum of one hour.
- .3 The product must not be applied on longitudinal seams in the pavement or on crack sealant.
- .4 The product must not be applied over existing marking materials.
- .5 Measurement of wet film thickness of the paint for purposes of acceptance is done by the Laboratory engaged by the Owner in compliance with standard NQ 3700-

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927 (Appendix A).

2.8.8 Colour

- .1 The colour to be used for each element is indicated on the plans. All omissions or deviations must be brought to the attention of the Engineer as soon as possible.

2.8.9 Quality of medium duration product

- .1 Paint used for medium term markings must comply with MTQ standard 10202 "Peinture alkyde pour le marquage des routes" [Alkyd paint for road markings], most recent edition. The product must be resistant to damage from contact with sodium chloride or other chemical agents used for deicing the road and to contact with oils in paving products and motor oil.
- .2 The product must be applied in its liquid state using a modified paint gun allowing the application of the product in a single coat 120 mm wide and 0.64 mm thick.
- .3 In order to ensure retro-reflective performance, reflective glass micro beads shall be sprinkled on the paint immediately after application.
- .4 Drying time must not exceed 60 minutes, after which time traffic must be allowed back on the road.

2.9 GUARD RAILS

- .1 Guardrails are flexible with steel cables and steel posts fitted with a stop plate in the format standardized DN-VIII-3 GF-001,
- .2 Extra width of the shoulder of 1.3 m is required for the installation of the guardrail. Poles slide flexible security must be installed at a minimum distance of 500 mm from the top of the slope,
- .3 Installation of the slide flexible security must comply with the requirements of Cahiers Standards, Road Works, Volume VIII "restraint", latest edition,
- .4 The connection of the new guardrail to flexible existing guardrail must be made with a smooth transition zone, in order to reach its location. Connecting cables with existing cables should be made with trim such as drawing normalizes DN-VIII-3 GF-006 as required by the VOLUME VIII MTQ but without weakening the existing tension in the cables,
- .5 Steel poles will S75 x 8, provided with a stop plate of 200 x 600 x 6. The distance between the posts should be the smallest possible in compliance with the standards.

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2.10 SHOULDERS

- .1 Shoulders are made of compacted MG-20b rock and must have a uniform width, as specified in the plans and cross-sections. The work is done after the placing of each layer of asphalt mix (base and surface courses), once the pavement has cooled to below 50° C. Payment is made only once.

PART 3 - EXECUTION

3.1 GENERAL

- .1 The construction of bases and pavement shall be done after spring thaw, once the site is completely free of snow-melt runoff water. The preparation and laying of asphalt mixes must be done in favourable weather and at an ambient temperature suitable for producing a smooth surface meeting the requirements of the present specification. It is not permitted to operate when moisture in aggregates affects the temperature of the mix or the pace of operations, or when the base is soaked or covered with puddles or mud. The temperature of the surface to be paved must be at least 5°C with an upward trend. When the surface temperature drops below 7°C, no surface course may be laid without the Representative of Parks Canada written permission. At all times, the mix must be compacted until it reaches the specified density. No surface mix is to be laid after October 15 without the Representative of Parks Canada permission.
- .2 At all times, the Contractor must take the necessary steps to reduce to a minimum dust emissions caused by the work.
- .3 The asphalt mix is composed of coarse and fine aggregates or fine aggregates alone, evenly coated with asphalt binder in a mixing plant and at a temperature favourable for mixing and laying.

3.2 ALIGNMENTS AND LEVELS

- .1 All work must be done in conformity with the alignments and levels indicated in the plans and details.
- .2 Except as otherwise indicated on the plans, final resurfacing elevations must be the same as the elevations for connection to existing pavement.
- .3 If obstructions or other circumstances not foreseen on the plans disrupt the work to the point that changes are required, the Representative of Parks Canada may require that work be modified or moved.

3.3 CONNECTION TO THE EXISTING ROADWAY

- .1 The connection to the existing pavement must be in accordance with DN-II-2-008 and as detailed plans. The Contractor makes the connection with the existing pavement and repair the seal with the existing asphalt pavement as follows:
 - .1 Make a saw cut near the excavation and install the conduit and asphalt;
 - .2 Following the trench backfilling, the final layer of backfill materials MG-20b in the online infrastructure will be compacted to 95% withholding tax at a thickness of 150 mm,
 - .3 Make a new saw cut in paving, 3 m (min.) foundations to preserve, remove the paving over this distance and excavated with slopes of 1.5 V; 1H up to 700 mm below the level of the road to connect with the proposed foundations;
 - .4 Saw cut up to a distance of 1.5 m to the existing pavement to preserve, proceed to the leveling of the existing pavement to a depth of 50 mm;
 - .5 Coat the sides of the pavement with a tack coat before paving.
 - .6 Lay 100 mm of asphalt concrete in two layers: a first layer of asphalt concrete (base course) with a compacted thickness of 60 mm applied immediately after filling of the excavation, and a second layer of asphalt concrete (surface course) of a compacted thickness of minimum 40 mm applied at a time deemed appropriate by the Representative of Parks Canada. These two layers of asphalt concrete must be bound together using an asphalt primer at the rate of 450 ml/m² of pavement.
 - .7 Only the top layer will be extended to the distance of 1.5 m after planning.
- .2 The original lineage must be repainted and included in the lump sum of the project or in the price of foundations and paving for additional quantities. After repairing the trench, the joints are hot milled by the method of regeneration heat for melting the joints.

3.4 SUBGRADE PREPARATION

- .1 This section covers the work to be done to ensure that the subgrade has the shape indicated by the longitudinal sections and cross-sections before proceeding with construction of the pavement structure.
- .2 The Contractor shall carry out the excavation and profiling infrastructure, excavate and remove the fill material surplus. All materials should be disposed off-site, as described in Section 31 23 11 - Civil - Excavation and backfilling.
- .3 The loading, transportation and disposal of excavation waste from subgrade

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- preparation in a site compliant with the Soil protection and rehabilitation of contaminated sites policy (MDDEFP) shall be done at the Contractor's expense.
- .4 Preparation of the roadbed where foundations for the various outdoor facilities will be built must be done in compliance with the relevant requirements of section 31 23 11 - Civil - Excavation and Backfilling and in accordance with the recommendations of the geotechnical tests.
 - .5 Subgrade preparation includes grading work necessary for creating a roadbed on which will be built the foundations of road infrastructure, consistent with the profile indicated on the plans and details. The roadbed must be profiled in a manner that permits drainage of foundations to ditches. The subgrade must be smooth and free of ruts and depressions. The layer of topsoil in the traffic lane right-of-way must be excavated and stockpiled.
 - .6 The surface to be prepared must be perfectly drained beforehand and for the duration of preparation work. If there are small inequalities, deviating less than 50 mm from the required profile, it is sufficient to level the entire surface with a grader, then to compact the surface with the appropriate tools. If the surface is rough or uneven, the Contractor must first scarify it to the level of the bottom of the depressions and recommence compacting operations.
 - .7 If it is impossible to obtain an even, stable surface due to the presence in the subgrade of materials in poor condition, these materials must be excavated.
 - .8 Any borrow required for filling such excavations must be of a quality acceptable to the Representative of Parks Canada.
 - .9 Before laying subbase or base course materials, the evenness of the surface is to be verified by the Engineer. Work to install the subbase or base course may not begin before the Engineer has accepted the subgrade.
 - .10 Next, compact the backfill in thickness of at least 300 mm, such that the compactness of subgrade soil is everywhere at least 95% of its maximum dry density as determined via the modified Proctor test.
 - .11 All subgrade surfaces that are not accessible to heavy compacting machinery shall also be perfectly compacted, using appropriate small machinery or a vibrating plate.
 - .12 Any soft or unstable points must be excavated and filled with more stable material with similar grain size distribution to surrounding materials.
 - .13 At locations where the ground profile must be raised to the level of the planned subgrade, the Contractor must plan for raising with modified MG-112, in layers 300 mm thick and compacted to 95% of maximum density as determined by the modified Proctor test.

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- .14 After compacting and profiling the roadbed, the Contractor must, as soon as possible, begin construction of the subbase so that the subgrade is not excessively exposed to the elements and altered as a consequence.

3.5 SUBBASE

- .1 The subgrade surface must be prepared in accordance with the requirements of the articles titled "Compacting of materials" and "Subgrade preparation." The thickness of the sub foundation is 450 mm of granular materials MG-112. Aggregates are spread in layers of uniform thickness not to exceed 300 mm. The spreading method used must prevent all segregation of aggregates.
- .2 Compacting is then done using the method described under "Compacting of materials." The required degree of compactness is 95% of maximum dry density as determined by the modified Proctor test.
- .3 Before laying the subbase, the top subgrade must be free of ruts or other depressions and must not deviate by more than 10 mm from the levels and longitudinal and cross sections shown on the plans.

3.5.1 Construction method

- .1 Subbases are then constructed in successive layers. Specified aggregates are spread across the entire width of the subgrade or sub foundation at a uniform thickness, without segregation, in compliance with the cross section of the planned pavement. The surface is then levelled and, if necessary, moistened or dried in order to obtain the desired compactness.
- .2 Each layer must be compacted separately in compliance with the requirements of the section on "Compacting of materials." The required degree of compactness is 95% of maximum dry density as determined by the modified Proctor test. Areas that are difficult to access must be compacted manually using appropriate tampers, special compactors or vibrating plates.
- .3 The Contractor shall also include the costs of the following procedure: laying of the subbase and base course, adjustment above public utilities to 100 mm \pm 25 mm below the level of the surface course.

3.5.2 Shaping

- .1 The final shaping of the street must have a slope and a path consistent with the plans and longitudinal sections and must comply with tilt, slopes, horizontal and vertical curves and connect perfectly to the existing pavement in levels and in curves.

3.5.3 Unstable or contaminated areas

- .1 If weak points slump under the compactor or subgrade soil or mud mix with the

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subbase, such unstable or contaminated materials must be removed and those portions of the subbase shall be rebuilt after strengthening of the subgrade.

3.5.4 Subbase cleaning

- .1 If paving is done long after the subbase is constructed, the subbase is to be decontaminated. Such work includes the removal and transportation of materials deemed by the Representative of Parks Canada to be contaminated, and the shaping and compaction of the subbase.

3.5.5 Placing

- .1 Implement the geotextile membrane, once the infrastructure is inspected and approved by the Representative of Parks Canada.
- .2 Install subbase materials, once geotextile inspected and approved by the Representative of Parks Canada.
- .3 The contractor shall build:
 - .1 A sub foundation 450 mm thick made of MG-112 type material compacted to at least 95% of the modified Proctor value and in compliance with standard NQ 2501-255.
 - .2 A base course 150 mm thick made of MG-20 type crushed rock compacted to at least 95% of the modified Proctor value and in compliance with standard NQ 2501-255.
- .4 Acceptance of material and density tests are described in section 31 23 11 - Civil - Excavation and Backfilling
- .5 At the joint between new and existing pavement structures, a transition must be made in the various foundation layers with a slope having a ratio of 1.5 V : 1 H.
- .6 For temporary traffic structures, the Contractor must place 250 mm of MG-20 type crushed rock compacted to 90% of the Proctor value over a type II geotextile membrane. The contractor must keep such temporary structures in good condition at its own expense, for the duration of the work.

3.6 PAVING

3.6.1 General

- .1 Materials (finishers, compactors, etc.) and the use of asphalt mixes must be compliant with the requirements (technical only) described in section 13 - Revêtement de chaussée en enrobé [asphalt road paving] of the MTQ's general specifications (2003).

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- .2 The payment terms described in section 13 - Revêtement de chaussée en enrobé of the MTQ's general specifications (2003) do not apply to this project.

3.6.2 Transportation of mix

- .1 The mix must be transported to the site in sealed (boxed) vehicles. All loads must be delivered early enough to allow for spreading and rolling in daylight. It is never permitted to overheat a mix to counteract cooling caused by travel time, no matter how long the trip.

3.6.3 Asphalt covering

- .1 The asphalt covering will be composed of:
- .1 A base course 60 mm thick made of asphalt mix, minimum 93-98% type ESG-14 (PG58-34 asphalt) (LC 26-040/045), conducted in fall 2013.
 - .2 A surface course 40 mm thick asphalt mix, minimum 93-98% type ESG-10 (PG58-34 asphalt) (LC 26-040/045), conducted in spring 2014.
- .2 Each course of asphalt mix must have a uniform texture, free of segregation or bleeding, be regular and compliant with the profiles specified on the contract drawings. Cross sections and longitudinal sections of the paved surface must allow for water runoff to catch basins, with no accumulations of standing water. After the final compacting of each course, the Representative of Parks Canada will verify the alignment and slope. The profile of each course must not deviate by more than 6 mm (1/4 in) per 3 m (10 ft) from the profile specified on the contract drawings. The thickness of each course must not deviate by more than 6 mm (1/4 in) from the specified thickness.
- .3 Run-off slopes on hard surfaces must not have a grade less than 1%, unless otherwise indicated.

3.6.4 Tack coats

- .1 The Contractor must apply a tack coat to surfaces to be paved, in the form of an RS-1 type emulsion in compliance with the MTQ's general specifications (most recent edition). On horizontal surfaces, the tack coat is applied uniformly using a spray bar under pressure.
- .1 At the residual rate of 0.5 L/m² for binders on aggregate surfaces (when required);
 - .2 At the residual rate of 0.25 L/m² for the tack coat on a paved, planed or newly paved surface.

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- .2 The Contractor shall take all necessary precautions to ensure that a tack coat does not spill onto already paved adjacent surfaces or surfaces that are not going to be covered with asphalt.
- .3 While the binder is curing, vehicle traffic must be detoured or controlled.
- .4 It is forbidden to apply binders during rain or on wet or frozen surfaces or when, unless recommended by the manufacturer, the ambient air temperature is below 10°C.
- .5 A surface to which a tack coat has been applied must be covered with the new asphalt course the same day if the road is open to traffic overnight.
- .6 All transverse joints and longitudinal seams must be brushed with an even coat of binder at the rate of 0.4 L/m².
- .7 Cutback is not to be used for tack coats.

3.6.5 Application of asphalt mix

3.6.5.1 *Mechanical*

- .1 Comply with the technical requirements of section 13 - Revêtement de chaussée en enrobé of the MTQ's general specifications (most recent edition).
- .2 When mixing and aeration of the asphalt mix are complete, use the paving machine to spread the mix to the desired elevations.
- .3 All surface, base and subbase courses are to be spread mechanically using a self-propelled paving machine driven by a competent operator. Adjustments to the subgrader, tampers, distributor screws, etc. are to be verified regularly to ensure that the mix has a uniform texture devoid of tearing, deformations or grooves. The operating mode (stop time, speed, etc.) of a paving machine must be such as to allow the laying of a course with the correct density and other characteristics. All asphalt mixes whose composition or temperature is non compliant must be rejected.

3.6.5.2 *Joints and seams*

Longitudinal seams must be parallel to the alignment lines. The paving machine must travel on a line parallel to the centre of the road. When two paving machines are working in echelon, the first follows the line and the second follows the edge of the strip of asphalt laid by the first. In order to achieve a hot, easily compacted seam, the two pavers are to drive as close to one another as possible and in no case separated by more than 75 metres. When a single paving machine is used, the mix is laid in alternation on either side of the road in strips not exceeding 200 metres in length in warm weather and 50 metres in cold weather. The Representative of Parks Canada may make an exception to this rule and indicate a

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more suitable sequence considering the thickness of the mix, the temperature and the hourly production of the central plant. Whenever possible, the laying of asphalt at the end of the day is to be organized so as to avoid leaving any longitudinal seams to be completed the next day. Joints between new and old pavement and between pavement laid on consecutive days are to be made with care in order to produce a perfectly continuous connection. In order to obtain well-made transverse joints, the edge of the previously laid course must be cut to the full depth, brushed with an even coat of emulsion and heated so as to make a heat seal.

3.6.5.3 Irregularities

- .1 Immediately after laying a course and before rolling, the surface is verified and any irregularities remedied. Accumulations of materials due to the grader are removed with a shovel or hoe. Scalping or other depressions are filled with hot mix and levelled. It is strictly forbidden in such cases to throw the mix in a manner that causes it to fan out.

3.6.5.4 Manual spreading

- .1 In locations that the paving machine cannot reach, hot mix is spread manually. This must be done carefully. The mix is applied evenly and spread in a loose layer of uniform density using rakes or hoes, taking care to avoid segregation. Before rolling, take care to check the surface with a rule and remedy any irregularities. Areas surrounding structures and covers and hard-to-access locations must be compacted with a hot iron.

3.6.5.5 Cleaning of manual tools

- .1 When manual tools are cleaned by flame, take care not to heat them to temperatures hot enough to burn the mix. When manual tools are cleaned with oil, the oil container is to be placed in a location where it cannot contaminate the mix.

3.6.5.6 Compacting

- .1 The instructions in the following articles are applicable to all pavement courses.
- .2 Rolling must begin as soon as the mix is strong enough to support the roller without significant deformation.
- .3 For initial rolling, use multiple-tire rollers. Rolling is completed with a steel roller that must produce a smooth, even surface compliant with the elevations indicated on the plans.

3.6.5.7 Number of rollers

- .1 The minimum number of rollers is two (2). However, the actual required number is that which makes it possible to create an asphalt coating whose surface course and density meet specifications.

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- .2 Rolling must be completed before sunset. An exception may be made to this rule if the Representative of Parks Canada deems that satisfactory precautions are being taken.

3.6.5.8 Rolling sequence

- .1 The rolling sequence must be such that the asphalt coating has a surface course and compactness that meet specifications and that transverse joints and longitudinal seams are completely waterproof and are practically identical to the rest of the surface.

3.6.5.9 Temperature control

- .1 Storage temperature and central plant mixing temperature of the asphalt must be less than or equal to the maximum temperatures indicated on the asphalt's certificate of compliance.
- .2 The decline in temperature of an asphalt mix between mixing and laying on the site must not exceed 15°C.
- .3 All mixes that fail to meet these requirements shall be rejected.
- .4 Traffic must not be allowed to use freshly laid asphalt until the temperature of the surface has cooled to less than 50°C.

3.6.5.10 Checking compactness

- .1 Rolling is to continue until the mix reaches the required density.
- .2 The Contractor is free to check the compactness of each layer using the method of its choice. Compactness must be between 92.0 and 98.0% of that indicated by standard LC 26-320.
- .3 All layers of asphalt must be compacted to at least 92% of the maximum density indicated by standard LC 26-320.

3.6.5.11 Quality and evenness of asphalt

- .1 The surface of each layer (surface course, binder, base) must have a uniform texture, free of segregation, and be regular and compliant with prescribed alignments and slopes.
- .2 After final rolling of each course, the Engineer verifies alignments and slopes. The profile of each course must not deviate from the prescribed profile by more than 6 mm. All irregularities or depressions greater than 5 mm per 3 m on surface courses or 6 mm per 3 m on other courses must be corrected.
- .3 Verification of irregularities is done using a 3 m rule fitted with a level, which the

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Contractor must have at its disposal on the site at all times.

- .4 Any defective section must be replaced or remedied to the Engineer's satisfaction before the Representative of Parks Canada will allow another course to be laid or accept the completed work. The mix used for correcting depressions must be such that the nominal diameter of the largest particle is smaller than the mean depth of the depression.

3.6.6 Determination of compactness

- .1 The compactness percentage is determined by the gross density of the mix (specific gravity measured by radiation-type densimeter divided by the specific gravity of water at 25 °C, i.e. 997,044 kg/m³) divided by the maximum average density on that day as measured during receiving inspection of the asphalt mix, multiplied by 100.

3.7 DAMAGE TO EXISTING PAVEMENT

1. If Contractor damages to the existing pavement outside the limits of work, repair and connection to the existing pavement must be made in accordance with section "Connecting to the existing pavement. However, this work will not be paid as additional amount and repair is at Contractor' expense.

3.8 CONTROL

- .1 Notify the Representative of Parks Canada and the Laboratory at least 24 hours before laying any asphalt mix.
- .2 While asphalt mix is being laid, a representative of the Laboratory must collect samples and be present for the work. Tests must be done by the Laboratory designated by the Owner. The cost of these tests and supervision shall be borne by the Owner.
- .3 Every layer of asphalt mix must be compacted to 92% of the maximum density as specified in standard LC 26-320.
- .4 All asphalt mixes must be resistant to rutting. Rutting resistance tests must be performed in compliance with MTQ standard 4201, in particular table 4201-1.
- .5 The Contractor must supply a data sheet demonstrating that asphalt mixes are resistant to rutting.

3.9 WASTE MATERIAL

- .1 Waste material shall be disposed of in compliance with section 31 23 11 - Civil - Excavation –and Backfilling.

3.10 SAMPLING SEQUENCE FOR ASPHALT MIXES

- .1 Tests required for each analysis type are presented in tables 3.9.2.1 and 3.9.2.2 below:

3.11.1 Production-reference

- .1 For the asphalt mixes in Tableau 4201-1, a type C analysis is required on each of five production reference samples. Type E analysis must also be performed on one of the five samples.
- .2 For the asphalt mixes in Tableau 4202-1, a type B analysis is required for each of the five production reference samples. Type E and type D analysis must also be performed on one of the five samples.

3.11.2 In production

- .1 For each lot, the following analyses are required:

TABLE - TYPES OF ANALYSIS REQUIRED FOR EACH SAMPLE

NUMBER OF LOT SAMPLE	REFERENCE STANDARD	
	4201	4202
1	B	B + D
3	B	B
All other samples	A	A

TABLE – LIST OF TESTS REQUIRED FOR EACH ANALYSIS TYPE

DESCRIPTION	STANDARD	ANALYSIS TYPE				
		A	B	C	D	E
Granulometric analysis	LC 26-360	x	x	x		
Determination of filler mass in excavated material	LC 26-110	x	x	x		

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Determination of bitumen content	LC 26-100	x	x	x		
Determination of maximum density	LC 26-045	x	x	x		
Determination of percentage of air voids and compactness in compacted hot mix asphalts	LC 26-320		x	x		
“Marshall” method for determining sample resistance to deformation				x		
Determination of compactability of hot mix asphalts using gyratory shear press	LC 26-003				x	
Water content	LC 26-001					x
Resistance to rutting (Note 1)						x

Note 1: The rutting test is required when the asphalt used is performance class PG 64-34; for other performance classes the test is required when stipulated in the contract documents.

3.11 ROAD MARKINGS

3.12.1 General

- .1 The location of the work is indicated on the plans provided with the proposal. The Contractor shall perform the marking work in compliance with the standardized plans and following the details shown on the Corporation’s sample plates and those appearing on the proposal plans or in accordance with the Representative of Parks Canada instructions.
- .2 Pavement markings have the following colour and width:

	<u>Dimension</u>	<u>Colour</u>
Lines marking parking spaces	125 mm (5 in)	White
- .3 Marking of parking spaces for handicapped persons must comply with the standards of MTQ volumes I and IV.
- .4 All materials such as paint, thinner, micro beads and other equipment, tools and labour for performing the work are supplied and paid by the Contractor.

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3.12.2 Scope of work

- .1 Marking with the medium-duration product shall include:
 - .1 Centre lines;
 - .2 Division lines (solid and broken).
- .2 Marking with paint shall include:
 - .1 Stop lines;
 - .2 Crosswalks;
 - .3 Arrows;
 - .4 Symbols for reserved lanes.
- .3 The Contractor shall do the pre-marking.
- .4 Designated locations are shown on the plans and may be modified upward or downward upon written instruction from the Representative of Parks Canada.
- .5 In its bid, the Contractor shall indicate the equipment and labour that it intends to make available to the Owner for carrying out the work.
- .6 In the case of a subcontracted contract, the subcontractor shall be governed by this specification. The Contractor shall be responsible for all flaws or unjustified delays in work done by its subcontractor.

3.12.3 Conditions for applying paint

- .1 One of the quality criteria for ensuring high-performance markings is the controlled application of paint:
 - .1 Paint must be applied on clean, dry surfaces.
 - .2 Places susceptible to accumulations of foreign matter such as rocks, soil, oil, etc. must be completely cleaned before painting. Mechanical street sweepers are recommended for this work.
 - .3 To achieve uniform, satisfactory results, the speed of the painting truck must not exceed 20 km/h.
- .2 Paint must not be applied to the pavement in the following conditions:
 - .1 Wet pavement.
 - .2 There is a risk of the paint being exposed to rain before a reasonable drying

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time has elapsed.

- .3 The air temperature is below 16°C (60°F) or above 32°C (90°F).
- .4 Relative humidity is above 85%.
- .5 The pavement is covered with soil, debris or other dirt that can impede painting.
- .3 The Contractor is not to use any thinner to accelerate drying or for any other reason.

3.12.4 Application of markings in parking lots

- .1 Premarking must be done with white and yellow depending on line position, and must be masked as well as possible by the final painting.
- .2 Only centre lines and pedestrian and school crosswalk lines not at intersections are painted yellow unless otherwise indicated in the marking plans.
- .3 The proportioning characteristics of the paint and micro beads are the following:
 - .1 Rate of application for unbroken line: 75 L/km (27.5 gal (UK)/mi),
 - .2 Thickness of line: 0.60 mm (0.024 in) (fresh paint), tolerance 10%,
 - .3 Kilograms of micro beads per litre of paint: 0.60 kg/L (6 lb/gal (UK)) minimum, tolerance 10%,
 - .4 Concerning the application of micro beads, it is imperative that they be applied uniformly over the entire marked surface in order to provide maximum effectiveness.
- .4 Cones must not be removed before the paint is dry. The Contractor must install the cones no more than 15 m (50 ft) apart. The cones must be 450 mm (18 in) high and class II as described in the BNQ traffic cones standard ("Cônes de signalisation"), NQ 1941-501.
- .5 The Contractor is responsible for removing by abrasion any paint spread by vehicles contacting the paint before drying, spilled by accident on the pavement or used for applying markings due to Contractor error.
- .6 Corrections must be made by abrasion assisted by specialized material, and not through the use of neutralizing paint, and there must be no visible paint marks after removal work.
- .7 All errors on the part of the Contractor must be rectified within seventy-two (72) hours or less.

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- .8 Where indicated on the plans, the Contractor must remove existing painted markings. To do this, the Contractor must remove the markings using specialized machinery and not through the use of neutralizing paint.

3.12.5 Application of markings

3.12.5.1 *Conditions for application of medium-duration product*

- .1 In order to ensure the best possible adhesion, the product must be applied in liquid form between 10 °C and 50 °C.
- .2 Ensure that the surface is clean and dry. For new pavement, ensure that all traces of oil have been removed.
- .3 For markings on old surfaces, ensure that the surface is completely dry and clear of dust and sand or any other substance that may impair the product's adhesion to the pavement.
- .4 Do not apply medium-duration product over existing lines when said lines are made of paint, urethane or epoxy resin. The product may be applied over the same product or over thermoplastic.

3.12.5.2 *Premarking the pavement*

- .1 When the Contractor lays the asphalt mix, it must apply temporary markings with reflective discs, delineators or equivalent devices, no more than 10 m apart and no more than 5 metres apart on curves and lane separation lines, before allowing traffic to return to the road.
- .2 Premarking distances during work must respect the spacing indicated in articles 16.9.1 and 16.9.2 of the MTQ's general specifications (CCDG 2003).
- .3 Premarking must be done with premarking discs. The premarking must be done on lane separators, edge lines and approach-nose lines.
- .4 The Contractor must pay special attention to the manner in which premarking is done. The premarkings must be of a width that ensures they will be completely covered by the newly paved lines and will not be visible after the work is complete.
- .5 Yellow or white reflective premarking discs must be thermoplastic, rotproof, non absorbent, chemically stable up to 200 °C and inert in the presence of sodium chloride or calcium chloride. Retro-reflectivity, flexibility and durability must meet BNQ standard 6830-101. The diameter of discs must be 95 to 100 mm with a thickness of 1.5 to 2 mm including adhesive. The method of adhesion to the pavement must be by pressure, with no protective paper.
- .6 All costs associated with installation of premarkings, including purchase, delivery and installation, are included in the bid.

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3.12.5.3 *Dimensions of markings*

- .1 For lane demarcations, the medium-duration product must have a minimum thickness of 0.64 mm and a nominal width of 120 mm. Tolerance for the width of markings is +10% and -5%. In the case of double lines, the distance between the lines is 120 mm.
- .2 The dimensions and placement of lines and arrows must comply with the Representative of Parks Canada instructions for painted markings.

3.12.5.4 *Alignment*

- .1 For lane separators, the alignment must be followed within + or – 25 mm with relation to the marking plan or the Representative of Parks Canada instructions.
- .2 During application, it is important to paint very straight lines to avoid subjecting drivers to a visual zigzag effect.

3.12.5.5 *Spacing*

- .1 The spacing between lines must correspond to the marking plan or to the Representative of Parks Canada instructions.

3.12.5.6 *Removal of lines*

- .1 Upon approval by the Representative of Parks Canada, the Contractor must erase lines in locations where required for application of new markings to industry standards.
- .2 Note that all traces of markings must be removed.
- .3 If the Contractor will not apply markings to the road within 24 hours, it must install delineators after removal of the lines.

3.12.5.7 *Planning and removal residues*

- .1 Planing and removal residues must be disposed of in compliance with existing environmental laws and regulations.

3.12.5.8 *Work plan*

- .1 Before beginning the work, the Contractor must prepare and provide to the Representative of Parks Canada for approval a work plan for the markings. After receiving approval, the Contractor must adhere to this plan unless the Contractor and the Representative of Parks Canada reach an agreement on the modification of said plan.

3.12.6 Supervision

3.12.6.1 Quality control

- .1 At least twice per day, the Contractor must test the thickness of the wet paint film and measure the width of markings. Thickness measurement shall be done with an interchemical thickness gage before the application of glass micro beads.
- .2 The Contractor must test the thickness of the paint film and the width of the lines. Thickness is measured using an interchemical thickness gage.
- .3 A copy of the thickness tests must be submitted to the Representative of Parks Canada, who may perform certain tests including a thickness test without prior notice to the Contractor and with the Contractor's cooperation.
- .4 All non-compliant work shall be re-done at the Contractor's expense.
- .5 The disposal of waste material will be done in compliance with section 31 23 11 - Civil - Excavation and Backfilling

3.12.6.2 Laboratory tests

- .1 Samples may be collected by the Laboratory in order to check the compliance of materials used. If a sample tests non-compliant, all of the remaining product shall be replaced and the Contractor shall reimburse the Owner for all testing and control costs.
- .2 Sampling of the product is done by the Laboratory during execution of the work. The Contractor shall cooperate with Laboratory personnel in facilitating sampling of the product.
- .3 If the paint is found to be non-compliant, the Representative of Parks Canada may call a halt to the work. The Contractor shall then be required to prove the compliance of the product it wishes to use before being authorized to continue the work.

3.12 COLD PLANING

- .1 When required by the contract, existing paved surfaces are to be adjusted by restoring the longitudinal and transverse profiles by cold planing.
- .2 Equipment used for this purpose must be able to produce a planed surface with a regular plane without deformations, uniform texture and relative scratch depth less than 8 mm.
- .3 Wherever there is a lack of adhesion between the surface course and the base course, the depth of planing is increased such that the surface course is completely removed.

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- .4 On straight sections, planing passes cross at the division between traffic lanes. Unless otherwise indicated, a transverse slope of 2% (+ 0.2% tolerance) is re-established for each lane. On curves, banks are re-established by a uniform, rectilinear planing pass.
- .5 Near bridge deck joints, etc. planing is done to the edges of these elements, where the old surface course is removed using a conventional process. The surface is then cleaned and swept mechanically.
- .6 The Contractor is responsible for disposal of materials removed from the road complying with MDDEFP Policy.

END OF SECTION

PART 1 - GENERALITIES

1.1 RELATED SECTIONS

- | | | |
|----|---------------------------------|------------------|
| .1 | Civil - Generalities | Section 31 00 00 |
| .2 | Civil – Clearance and uprooting | Section 31 11 00 |
| .3 | Civil – Roadworks | Section 32 11 00 |
| .4 | Civil – Culverts – Pluvial | Section 32 11 00 |

1.2 SCOPE OF WORK

- .1 Ensure supervision of the work and supply all manpower, equipment, tools, materials, transportation and other services required to carry out and complete the work described and specified in this section and contract documents, including but not limited to: the excavation and backfilling of specified areas and the application of stockpile topsoil and humus in preparation for revegetation on shown areas on drawings.

1.3 REFERENCES

- .1 Bureau de normalisation du Québec (B.N.Q.).
.1 NQ 0605-100/2001 : Landscaping using vegetation.

1.4 ELEMENTS TO BE SUBMITTED

- .1 It is strictly forbidden to import topsoil or plant from outside the La Mauricie National Park.
- .2 Existing humus and topsoil must be removed and stockpiled and put for later use. The stockpiles must be covered to protect materials from weather.
- .3 If required of topsoil or plant from outside La Mauricie National Park, they must be approved by the Representative of Parks Canada.

1.5 ELEMENTS TO BE SUBMITTED

- .1 Advise the Representative of Parks Canada of the proposed source of topsoil (Within limits of La Mauricie National Park) or vegetation (from other location of La Mauricie National Park) and provide access allowing said representative to conduct the analysis of materials, The acceptance of the topsoil will depend on the results of soil analyses and the inspection, Work shall not start until the topsoil or plant have been approved by the Representative of Parks Canada.

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- .2 Topsoil tests and analyses shall be carried out by a laboratory with the Owner assuming the cost of these.
- .3 Analyze the topsoil prior to stripping and stockpiling to determine its contents of clay, sand, mud, phosphorous, potassium (NPK), magnesium (Mg), soluble salts, growth inhibitors, and soil sterilizers as well as its pH.
 - .4 Provide the Representative of Parks Canada with a copy of the soil analysis report as well as recommended soil improvements.
 - .5 Submit a copy of the technical characteristics of biodegradable coconut net or approved equivalent

1.6 WORK SCHEDULE

- .1 Topsoil shall be spread and finish earthwork carried out at the appropriate time for undertaking sodding work under the best possible conditions, immediately to ensure recovery plant.

1.7 TOPSOIL AND FINISH EARTHWORK

- .1 Topsoil and finish earthwork consist in, but are not limited to, supplying the materials and manpower required to carry out the spreading of topsoil and finish earthwork, according to good engineering practices, including:
 - .1 Stripping topsoil and humus and stockpile them for reuse.
 - .2 Supply and application of stockpiled topsoil and humus to a minimum thickness of 150 mm where specified by the Representative of Parks Canada.
 - .3 Topsoil mixes including granulometry and specified amendments.
 - .4 Finish earthwork.
 - .5 Finish levelling according to specified tolerances.
 - .6 Provide and set up of the biodegradable coconut net, including pickets to retain topsoil.
 - .7 The cleaning and off-site disposal of non-reusable materials at a location complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.

PART 2 - PRODUCTS

2.1 SOIL

- .1 Loam: loose soil, neither too rich in clay nor too poor in sand, whose organic content varies between 4 % and 5 % for sandy loam and between 2 % and 3 % for clayey soil, the maximum admissible humus being 20 %. This soil's pH must be between 5.5 and 7.0, The soil must also be free of subsoil, roots, vegetation, debris, toxic matter and stones more than 50 mm in diameter.
- .2 Black soil (humus): consisting of decaying products, sufficiently supple and homogeneous, free of colloidal residue, wood, sulfur and iron, containing less than 60 % of organic materials by weight, and having a maximum water content of 15 %, The size of the shredded particles must be equal to or smaller than 6 mm.

2.2 MIX OF SCREENED TOPSOIL

- .1 Mix for areas to be sodded and seeded:
 - .1 Two parts loam.
 - .2 One part black soil.
 - .3 One part coarse sand.
 - .4 3 % to 7 % organic matter.

2.3 CHARACTERISTICS OF MIXES

- .1 The cation exchange capacity (C.E.C.) must be between 10 and 20.
- .2 The chemical verification of the soil shall be carried out using the "Walkey Black" oxidation method.
- .3 The acidity level (pH) must be 6.5.
- .4 Include the following chemical element in the proportions shown:

Chemical elements	Proportion
Phosphorous (P)	100 ppm
Potassium (K)	125 ppm
Magnesium (Mg)	200 ppm
Calcium (Ca)	2 000 ppm

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- .5 Fall within the following grading range:

Screen	Passing %
10 mm	100
5 mm	98 to 100
1,25 mm	90 to 97
630 µm	65 to 90
315 µm	25 to 65
160 µm	15 to 25
80 µm	5 to 15

- .6 Water retention capacity: maximum 20 %.

PART 3 - EXECUTION

3.1 PREPARATION OF EXISTING AREA

- .1 Level the ground, filling dips and creating a slope favoring the flow of water, Remove soil that has been contaminated by toxic materials, Remove debris as instructed by the Representative of Parks Canada.
- .2 Loosen to a depth of 100 mm the entire area covered by the foundation layer to be covered in topsoil, Repeat the operation wherever the transportation material and spreading of the soil have compacted said foundation layer.
- .3 Clear the surface of debris, roots, vegetation branches and stones more than 50 mm in diameter.

3.2 SPREADING OF THE TOPSOIL

- .1 Areas to revegetation.
- .1 Have the Representative of Parks Canada inspect and approve the condition of the foundation layer before starting to spread the topsoil.
- .2 Where revegetation work is to be carried out (as specified by the Representative of Parks Canada and the plans), spread the topsoil and humus on the approved and non-frozen foundation layer in even layers containing an adequate amount of water.
- .3 Spread the topsoil according to instructions, to a thickness of at least 150 mm on the areas or according to the Representative of Parks Canada request.
- .4 Manually spread topsoil around trees and plants where machinery is not allowed.

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- .5 Unless otherwise indicated on the drawings, spread topsoil to a thickness of at least 300 mm for ornamental grass trenches, 400 mm for shrubs and 1 000 mm for trees.
- .6 Take into account 25 % settling of soil volume when placing the soil, to comply with projected levels.

3.3 FINISH EARTHWORK

- .1 Level and move the soil so as to eliminate any irregularities and dips, ensuring the flow of surface water. Apply a layer of loosened loam, breaking it up and raking it.

3.4 RESTORATION OF STOCKPILING AREAS

- .1 Restore the condition of the stockpiling areas used for the work, to the satisfaction of the Representative of Parks Canada.

3.5 SURPLUS MATERIALS

- .1 Excavation surplus refused by the Representative of Parks Canada for the project's backfilling purposes (except for contaminated materials, demotion materials and special waste) can be disposed of on a site chosen by the Contractor and approved by the Representative of Parks Canada, and located at least 75 m (250 ft.) from a road's right of way or a waterway's shoreline, Materials must be placed so as not to be visible from a public road or obstruct the flow of water, Once disposal has been completed, materials must be leveled to the satisfaction of the land's owner(s). The Contractor must obtain a letter of authorization from each owner of the land used for the disposal of materials.
- .2 All of the aforementioned disposal work must be carried out in compliance with the MDDEFP's Directives and/or Regulations which, in the event of discrepancy with the above, will prevail over the preceding requirements.
- .3 All expenses relating to the use of a disposal and/or landfill site, including the cost of any permit and/or authorization, as well as loading, transportation and disposal costs are at the Contractor's expense.

END OF SECTION

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PART 1 - GENERALITIES

1.1 RELATED SECTIONS

- .1 Civil - Generalities Section 31 00 00
- .2 Civil - Excavation and Backfilling Section 31 23 11
- .3 Civil - Roadworks Section 32 11 00

1.2 SCOPE OF WORK

- .1 Ensure the supervision of the work and provide all the manpower, equipment, tools, materials, transportation and other services required to carry out and complete all work described and specified in this section and Contract documents, including but not limited to: the dismantlement of existing culverts including, the supply and installation of pipes, connectors and accessories, joints, precast head walls, sedimentation basins downstream and upstream of the culvert, riprap, etc.

1.3 REFERENCES

- .1 Bureau de normalisation du Québec (B.N.Q. – Quebec Standards Bureau).
 - .1 BNQ 1809-300/2004: Construction Work – General technical clauses – Drinking water and sewer pipes
 - .2 NQ 3624-027/2000: Polyethylene pipes and connectors (PE) – Pipes for carrying liquids under pressure – Characteristics and test methods
- .2 Ministère des transports du Québec (M.T.Q.) (Dernière édition) :
 - .1 Volume III du MTQ : « Ouvrages d'art », Chapter 4 : « culvert»
 - .2 Culvert Design guide from MTQ

1.4 DEFINITIONS

- .1 Backfilling: operation consisting in filling the trench with foundation, cover and fill materials or borrow material.
- .2 Gasket: a rubber ring, which provides a watertight joint for connectors, pipes and couplings to head walls, etc.

1.5 SAMPLES

- .1 Present samples for testing purposes to the Representative of Parks Canada at the latter's request, and at the Contractor's expense.

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1.6 SHOP DRAWINGS

- .1 Shop drawings are required but are not necessarily limited to the following :
 - .1 Culverts and accessories
 - .2 Headwall
 - .3 Geotextile membranes
- .2 Work related to the drawings may only start after said drawings have been revised by the Representative of Parks Canada.
- .3 The Contractor shall present an exhaustive list of the materials to be used, including the name of the manufacturer and supplier.
- .4 Within the limits of the Contract, all materials must be uniform and come from the same manufacturer.

1.7 CERTIFICATION OF MATERIALS

- .1 At least 2 weeks prior to the start of the work, present the results of tests conducted by the manufacturer and the certificate attesting that the pipes comply with the requirements of this section.
- .2 Ensure that pipes bear the certification stamp.

1.8 TRANSPORTATION, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in compliance with the manufacturer's instructions.
- .2 The Contractor shall take the following precautions when handling pipes:
 - .1 The pipe shall be handled so as not to touch sharp objects.
 - .2 Avoid impact in lifting.
 - .3 Storage surfaces shall be flat and clean
 - .4 Pipes shall not be dropped or allowed to knock against another pipe.
 - .5 Gaskets shall be protected from excessive exposure to heat, direct sunlight, oil and grease.
- .3 All materials found to be damaged or in poor condition shall be rejected or replaced at the Contractor's expense.

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1.9 WORK SCHEDULE

- .1 Prepare the work schedule so as to minimize interruptions to existing services and maintain a normal flow rate during construction work.
- .2 Provide the Representative of Parks Canada with the schedule of projected interruptions for approval, and comply with this duly approved schedule.
- .3 When service interruptions are required, inform the Representative of Parks Canada and Authorities involved at least 48 hours in advance.

1.10 WORK BY OTHER COMPANIES OR CONTRACTORS

- .1 If need be, the Contractor shall be required to coordinate his work with that of the Municipality or any other contractor, company or public utility, which may need to carry out work of any nature whatsoever, before or during the execution of work covered by this contract.

1.11 ALIGNMENT AND LEVELS

- .1 The Contractor shall strictly respect the layout and proposed pipe's profile for in the contract drawings, as well as the class and diameter of pipes, the number, positions and elevations.
- .2 The final location of an underground structure must not be more than 100 mm (4 in.) from that shown in the contract drawings. The final elevation of an underground structure must not be more than 25 mm (1 in.) from that indicated on these same drawings.
- .3 In the event that obstructions not covered by the drawings interfere with work to the point of requiring changes to the plans, the Representative of Parks Canada can require that work be modified or displaced accordingly.

1.12 WASTE MANAGEMENT AND DISPOSAL

- .1 Work is governed by a waste management plan under the responsibility of the Construction Manager. Work covered by this section shall comply with the requirements of this plan.

1.13 WORKING METHOD

- .1 The Contractor must submit written method of work for approval and the presentation of the method of work must be done in a reasonable period of 2 weeks before the start of the work and meet the requirements of Parks Canada, and MDDEFP MNR. In addition, it must consider the methods permitted work of "Environmental Protection" mitigation measures in the section plus the following principles:

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- .1 Isolate the work area to work dry.
- .2 The Contractor shall exercise due diligence to minimize the duration of the work under water and on the banks, in a period of 10 days (interruption of the free flow of water).
- .3 The bed of the stream must regain its original profile after work.
- .4 The Contractor shall minimize the width of the work or machinery shall not be operated beyond the limits of the influence of the work.
- .5 The Contractor shall maintain a flow of the river downstream of the work area with a pumping system or a nozzle.
- .6 Work streams to be performed during the period prescribed by Parks Canada, or when the river dried up completely.
- .7 Provision to prevent small fish from getting into the pumping system.
- .8 Provide devices limiting the release of sediment in the river, especially if there is pumping and when watering.
- .9 Revegetalizing slopes and banks disturbed by the work without delay and to ensure effective recovery plant.
- .10 Take the necessary measures to prevent the transport of fragments Warbler outsidee the already affected areas.

1.14 .1 REMOVAL OF CULVERTS

- .1 Work related to the removal of sewer sections consists in, but is not limited to, the supply of materials and labour required for the removal, according to good engineering practices, of sections shown in the plans and specifications, including:
 - .1 Saw cuts on the pavement.
 - .2 The removal of existing pavement infrasctructure.
 - .3 The excavation according to drawings, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the MDDEFP's *Soil Protection and Contaminated Sites Rehabilitation Policy*
 - .4 The dewatering of trenches and diversion of water in the pipes
 - .5 The complete removal of existing culverts, as well as their transportation to the site designated by Owner authorities.

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- .6 If no new structure or culvert is provided at these locations, The Contractor must backfill cavities produced by culvert removal to the transition zone and that, with materials from the project work, previously approved by the Representative of Parks Canada and according to the requirements of specifications.

1.15 INSTALLATION OF CULVERTS

- .1 Work related to culverts consists in, but is not limited to, the supply of materials and labour needed to carry out, in keeping with good engineering practices, the installation of culverts of the diameters and materials specified in the plans, including:
- .1 The excavation, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the MDDEFP's *Soil Protection and Contaminated Sites Rehabilitation Policy*
 - .2 Pipes and head walls.
 - .3 The diversion and control of water and dewatering of trenches in accordance with section Environment Protection.
 - .4 The supply and placement of the base course and surround on compacted ground.
 - .5 The supply and placement of riprap and geotextiles, If required.
 - .6 Accessories.
 - .7 The supply and placement of lean concrete, if required.
 - .8 Backfilling with an approved material or borrow material up to the infrastructure
 - .9 The protection and repair of public utilities and all other work required for the full use of these structures.

1.16 DIGGING OF THE DITCH

- .1 Work consists in, but is not limited to, the supply of materials and labour needed to carry out, in keeping with good engineering practices, the reprofiling of the ditch, including:
- .1 The excavation, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the MDDEFP's *Soil Protection and Contaminated Sites Rehabilitation Policy*

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- .2 Shaping as per the typical section for ditches along roads and embankment slopes stipulated in the plans and specifications
- .3 Connection to existing ditches
- .4 Excavation and shaping of sediments basins and slopes as specified on plans
- .5 The supply and placement of riprap and geotextiles
- .6 The supply and installation of top soil as per section 32 91 21 – Civil Topsoil and Finish Earthwork, and hydraulic seeding in keeping with the requirements of section 32 92 21 – Civil – Topsoil and Earthworks
- .7 The restoration of the site.

1.17 REPROFILING OF THE DITCH

- .1 Work related to the reprofiling of ditches consists in, but is not limited to, the supply of materials and labour needed to carry out, in keeping with good engineering practices, the reprofiling of the ditch, including:
 - .1 The mowing of grass, the removal of scrub growth, roots and obstructing branches, including the loading and off-site disposal of materials, if not use for vegetalization
 - .2 The excavation, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the MDDEFP's *Soil Protection and Contaminated Sites Rehabilitation Policy*
 - .3 Shaping as per the typical section for ditches along roads and embankment slopes stipulated in the plans and specifications
 - .4 Reprofiling in keeping with elevations and embankment slopes shown in the plans
 - .5 Connection to existing ditches.
 - .6 Excavation and shaping of sediments basins and slopes as specified on plans
 - .7 The supply and placement of riprap and geotextiles
 - .8 The supply and installation of top soil as per section 32 91 21 – Civil Topsoil and Finish Earthwork,
 - .9 The restoration of the site.

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1.18 HEADWALL

- 1 Work consists in, but is not limited to, the supply of materials and labour needed to carry out, in keeping with good engineering practices, the installation of a headwall, including:
 - .1 The excavation, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the MDDEFP's *Soil Protection and Contaminated Sites Rehabilitation Policy*
 - .2 The supply and installation of a precast headwall reinforced concrete, including cut-off walls, as shown on plans and standard drawing DN-III-4-011 from MTQ
 - .3 The supply and installation of unshrinkable fill, the geotextile and protective riprap
 - .4 Accessories
 - .6 Backfilling with an approved material up to the infrastructure.

1.19 RIPRAPPING OF PIPE EXTREMITIES (PIPES, SEDIMENTS BASIN, DITCHES, EMBANKMENTS STABILITY,ETC)

- .1 The works of this item includes, but is not limited to, all materials (riprap and geotextile),, special parts labour and equipment required for the full execution of this work, including:
 - .1 The excavation and preparation of the site for the placement of the cover as specified on plans.
 2. The slopes of road embankment located 1.5 H : 1V and 2H : 1V should be protected by mechanical stabilization. Any slope steeper than 1.5H: 1V will not be permitted.
 3. The excavation, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the MDDEFP's *Soil Protection and Contaminated Sites Rehabilitation Policy*
 4. The supply and placement of riprap and geotextiles TEXEL 912 as specified on plans.
 5. The anchorage at the bottom of the riprap and the transition slopes with the natural ground level and other requirements shown on the plans.
 6. The limits of riprap on the plans are approximate and should be adjusted according to the proposed slopes and natural slope of the land and according to the details indicated on the plans.

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1.20 RIPRAP PROTECTION (PROVISION)

- 1 This item is applicable only at the request by Representative of Parks Canada or to have approval. The unit price for this item includes, without limits, supply and installation of all materials (riprap and geotextile) , special parts , labor and machinery required for the completion of this work including:
 1. The excavation and site preparation for coating 100-200 stone thickness 350 mm;
 2. The excavation, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the MDDEFP's *Soil Protection and Contaminated Sites Rehabilitation Policy*
 3. The supply and placement of riprap and geotextiles TEXEL 912 and crushed stone 100-200 mm with 350 mm in thickness.
 4. The anchorage at the bottom of the riprap and the transition slopes with the natural ground level.

PART 2 - PRODUCTS

2.1 PIPES

- .1 Reinforced concrete pipes: Class IV reinforced concrete. complying with the requirements of the NQ 2622-126 for specified diameter., or as shown on plans.
- .2 Joints shall have rubber gaskets complying with the requirements of the NQ 2622-126 or ASTM C443M standard.
- .3 For each delivery, the Contractor shall provide the Representative of Parks Canada with an attestation of compliance. The attestation of compliance must contain the following information, for each production lot:
 - .1 The name of the pipes' manufacturer
 - .2 The production date and place
 - .3 The class, category and nominal dimensions
 - .4 Results of analyses, tests and quality control measures required by the NQ 2622-125 standard "*Tuyaux circulaires en béton armé et non armé – Guide de fabrication et de contrôle de la qualité en usine*" (Circular reinforced and non-reinforced concrete pipes — Guide to production and quality control in the plant)
 - .5 The production lot number.

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- .4 A production lot consists of pipes of the same class, category and dimension, which have been manufactured during a single ongoing production cycle under the same conditions.

2.2 GALVANIZED STEEL ACCESSORIES

- .1 When galvanized steel parts are required, hot dip galvanizing shall comply with the CAN/CSA-G164M-92, class C standard. The quantity of zinc deposited must be at least 610 g/m² of exposed surface.
- .2 The special paint, which can be used on the job site to protect a non-galvanized cut surface shall be a ready-mixed zinc-rich coating complying with CAN/CGSB-1.181 and ONGC 1-GP-181M standards.
- .3 The mechanical anchors used to secure accessories to the concrete walls must be of grade 316 stainless steel.

2.3 ALUMINIUM ACCESSORIES

- .1 Aluminium bars, pins, wires and extrusions, sheets or plates shall comply with the ACNOR HA.4-M1990 (6061-T6) standard. Rivets and bolts shall be of galvanized steel, except for the concrete wall's mechanical anchoring bolts, which shall be of grade 316 stainless steel. All aluminium elements shall be anodized after welding. Aluminium welding shall comply with the ACNOR HA.6-1980 (4043) standard. All aluminium in contact with the concrete, masonry or any material other than aluminium should be separated from the latter by neoprene at least 5 mm thick over the entire contact surface.

2.4 ASPHALT MASTIC

- .1 In these exceptional cases when it is used in the production of sewer pipe joints, asphalt mastic shall comply with the ASTM's C-14 and C-76 standards. It shall be cold formed, lend itself to trowel application, be freeze and water resistant, be unaffected by waste water, and harden over time while retaining its elasticity. The mastic used shall provide a high level of adhesion to concrete and adequate tensile strength.

2.5 BEDDING AND SURROUND MATERIALS

- .1 Base course and cover materials shall comply with Section 31 23 11 - Civil - Excavation and Backfilling

2.6 BACKFILL MATERIALS

- .1 Backfill materials shall comply with Section 31 23 11 - Civil - Excavation and Backfilling

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2.7 GEOTEXTILE MEMBRANE

- .1 Geotextile membranes shall comply with the MTQ's standard 13101 - Geotextiles and shall be of Texel 912 type, or approved equivalents.

2.8 UNSHRINKABLE FILL

- .1 The unshrinkable fill shall comply with article "Unshrinkable Fill" of section 31 23 11 - Civil - Excavation and Backfilling

2.9 HEADWALL

- .1 The precast headwall of each side of the culvert shall be of reinforced concrete, including cut-off walls complying with the Standard drawing DN-III-4-011 from MTQ and shall be model in accordance with the culvert size.
- .2 The headwall of the 1500 mm diameter culvert must be adapted to the diameter and meet the MTQ requirements. The Contractor shall provide a plan signed and sealed for the headwall including precast cutoff wall in reinforced concrete

2.10 RIPRAP

- .1 Riprap materials shall comply with the MTQ's standard 14501 - *Pierres d'enrochement et de revêtement de protection* (Riprap stone and protective covering) type and thick as specified on table 4.6-1 from Volume II from MTQ and on plans.

2.11 STONE, CEMENT STONE OR CEMENT CONCRETE STRUCTURES

- .1 When required by the bid documents, the Contractor shall build the required structures, whether these are walls for dry stone or cement stone, dry stone or cement stone riprap, dry stone or cement stone gutters, concrete rafts, etc.
- .2 This work shall be carried out in compliance with plans supplied by the Representative of Parks Canada and according to his instructions.

PART 3 - EXECUTION

3.1 PREPARATION WORK

- .1 Clean and dry pipes and headwalls prior to their installation and remove all defective material from the site, to the Representative of Parks Canada satisfaction.
- .2 Have pipes and headwalls approved by the Representative of Parks Canada prior to their installation.

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- .3 The Contractor shall take all measures to control water inflow into the trench during construction. This may respect the requirements of the "Environmental Protection" section.
- .4 Temporary means to control erosion and sediments
 - .1 Establish temporary means of controlling erosion and sediment to prevent soil loss and to prevent accumulation on the properties and adjacent pedestrian walkways, carried by runoff or sediment and dust particles carried by the wind, and, in accordance with [the requirements of competent authorities] [as indicated on drawings for the control of erosion and sediment] [directions to plan erosion control and sediment in particular site, prepared according to the most stringent of those set out in the document published by EPA 832/R-92-005 and those established by the competent authorities requirements.
 - .2 Inspect control methods to ensure cleaning until vegetalizations are complete.
 - .3 Removal of fences and restore and stabilize areas stirred during works.

3.2 VERIFICATION OF THE LOCATION

- .1 After marking the location of underground installations, and before any pavement cutting or removal, or excavation activities for the installation of the pipes have been carried out, the Contractor shall verify, in the presence of the Representative of Parks Canada, the location of existing culverts and location of proposed culverts.
- .2 Following the excavation work, In the event that a condition, which is significantly different from those prescribed in the contract be discovered, the Contractor shall immediately notify the Parks Canada Representative of this finding..
- .3 When necessary, the profile shall be adjusted according to the Representative of Parks Canada instructions, so as to avoid any sudden changes in the slope and alignment of the existing conditions.

3.3 DIGGING OF TRENCHES

- .1 Dig trenches in compliance with Section 31 23 11 - Civil - Excavation and Backfilling
- .2 Removal of rock can be done only by mechanical fragmentation or following written authorization by the Representative of Parks Canada.

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3.4 CULVERTS BEDDING

- .1 Have the layout and depth of the trench approved by the Representative of Parks Canada before placing the bedding material.
- .2 Drain trenches to install dry bedding materials for culverts.
- .3 The bedding and surround materials for pipes and underground structures shall be produced in compliance with the requirements of Section 31 23 11 - Civil – Excavation and Backfilling.
- .4 Bedding surface should be straight without hollow or high points.
- .5 Use bedding materials which are not frozen..

3.5 CULVERT AND HEADWALL INSTALLATION

- .1 The bottom of the trench dug to accommodate the culverts and headwalls must follow the required profiles. The strength of the soil at the bottom of this trench shall be uniform.
- .2 When the Representative of Parks Canada deems the soil at the bottom of the trench to be of poor quality, the Contractor shall remove this soil and replace it with good materials (crushed stone, gravel, granular material).
- .3 Pipes and headwalls are laid on a base course of MG-20b crushed stone compacted to 95% M.P. with a minimum thickness of 300 mm. as specified at section 31 23 11- Civil – Excavation and backfilling
- .4 The Contractor shall lay the culvert and headwalls carefully, in a regular alignment, starting with the downstream extremity. Must be really careful when installing cut-off walls (included on headwalls) in order to well compact the ground around the cut-off wall. Joints shall be perfectly sealed and secured. Backfilling shall be done on both sides at once using MG-20b crushed stone up to 300 mm on top of the crown and shall be compacted in successive layers of 300 mm to a density equal to 95% of that obtained by the Modified Proctor test. The rest of the trench shall be filled using excavated materials complying with norm 11.6.1 with borrow material to the level of the infrastructure.
- .5 Each extremity of the culvert shall be fitted as specified in the plans and specifications of this contract.
- .6 Except where otherwise indicated on the plans, culverts should be buried under the ditch 10% of its diameter for culverts Type 3 and 20% of its diameter culverts types 1 and 2. If culverts are located on the rock, they will not be buried.

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3.6 REPAIRS

- .1 All works to repair will be at the expense of the Contractor before the Representative of Parks Canada makes its recommendation of provisional acceptance.
- .2 If major repairs must be made after the tests described in previous articles, the Representative of Parks Canada will require a television inspection on repaired places and this at the Contractor' expense
- .3 The maximum tolerance will be accepted 10% of the nominal diameter In the case of shallows or reverse slopes. The Contractor shall repair the defective to make it acceptable.

END OF SECTION

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Le 27 septembre 2013

Monsieur Serge Alarie
DESSAU inc.
1060, rue University, bureau 600
Montréal (Québec) H3B 4V3

Objet : Recommandations géotechniques
Remplacement du ponceau 6, chaînage 2+010
Parc National de la Mauricie (Québec)
N/Réf. : 056-P-0004134-0-00-300-GE-0004-00

Monsieur,

Les services professionnels de LVM ont été retenus par Dessau inc. afin de soumettre des recommandations géotechniques dans le cadre du projet de remplacement du ponceau 6 situé au chaînage 2+010 dans le Parc national de la Mauricie.

1 Résumé du projet et des conditions de terrain

Le ponceau 6 existant, situé au chaînage 2+010, est un tuyau en tôle ondulée galvanisée (TTOG) d'un diamètre de 600 mm dont le radier est situé à environ 4,7 m sous le niveau de la chaussée actuelle. Celui-ci sera remplacé par un tuyau en béton armé de 600 mm de diamètre. La longueur présumée du nouveau ponceau sera la même que le ponceau existant, soit 27,1 m. De plus, il est prévu de mettre en place des murs de tête avec empierrement à l'aval et à l'amont du ponceau. Un bassin à sédiment d'environ 600 mm de profondeur sera également mis en place à l'amont.

Les faibles récupérations obtenues pour certains échantillons lors de la réalisation des 2 forages (TF-07-13 et TF-08-13) rendent difficile la détermination précise de la granulométrie dans les remblais.

Une couche d'enrobé bitumineux repose sur une fondation granulaire constituée généralement de sable et gravier à graveleux avec des traces à un peu de silt d'une épaisseur de l'ordre de 470 mm à 600 mm. Le remblai sous-jacent est constitué majoritairement d'un sable avec des traces à un peu de gravier et de silt jusqu'à près de 2,4 m de profondeur; toutefois, des couches silteuses sont présentes au forage TF-08-13 de même qu'une couche de silt argileux entre 1,8 m et 2 m de profondeur au droit du forage TF-07-13. Par la suite, les remblais sont de composition variable mais tous avec un pourcentage élevé de particules fines passant de sable et silt à silteux à un silt avec un peu d'argile à argileux. La consistance de ces derniers est parfois molle notamment entre les élévations 94,8 et 94,0 m au droit du forage TF-07-13 (élev. surface = 100,10 m).

Les sols naturels sous-jacents sont constitués d'un dépôt silto-argileux de consistance ferme à raide devenant très raide en profondeur et généralement très sensible au remaniement.

Lors de la réalisation des forages, les ponceaux étaient secs.

Basés sur les données disponibles du projet et sur les résultats obtenus à l'emplacement des sondages (de même que lors des essais de laboratoire), nos recommandations et commentaires géotechniques pour la conception du projet sont présentés aux sections suivantes.

2 Calculs aux états limites

Les recommandations qui suivent sont présentées conformément aux directives du « Code canadien sur le calcul des ponts routiers » (CAN/SCA-S6-06) qui exige que le calcul des fondations soit réalisé selon les calculs aux états limites. Ceux-ci se subdivisent en deux groupes : les états limites ultimes (ÉLU) et les états limites d'utilisation (ÉLTS). Les états limites ultimes portent principalement sur les mécanismes d'effondrement de la structure et portent donc sur la sécurité, tandis que les états limites d'utilisation correspondent aux mécanismes qui limitent ou empêchent l'usage prévu de la structure.

Les états limites calculés dans le cadre des travaux de remplacement du ponceau à l'étude sont les suivants :

- ▶ La résistance géotechnique à l'ÉLU (capacité portante);
- ▶ La réaction géotechnique à l'ÉLTS (tassement).

2.1 Résistance géotechnique à l'ÉLU à la capacité portante

La résistance géotechnique à l'ÉLU des fondations superficielles peut être évaluée à partir de la formule suivante provenant du code CAN/CSA-S6-06 :

$$q_{ult} = c N_c s_c i_c + q' N_q s_q i_q + 0,5 \gamma' B N_\gamma s_\gamma i_\gamma$$

où:	c	:	cohésion du sol sous la fondation, kPa
	q'	:	pression effective des terres au niveau de la fondation (= γ_1), kPa
	γ_1	:	poids volumique du sol au-dessus de la fondation, kN/m ³
	D	:	encastrement de la fondation, m
	γ	:	poids volumique total ou effectif du sol sous la fondation, kN/m ³
	s_c, s_q, s_γ	:	coefficients de forme selon la géométrie de la semelle : $s_c = s_q = 1 + (B'/L') (N_q/N_c)$ $s_\gamma = 1 - 0,4 (B'/L')$
	i_c, i_q, i_γ	:	coefficients d'inclinaison tenant compte de l'inclinaison de la charge : $i_c = i_q = (1 - \delta/90^\circ)^2$

$$i_v = (1 - \delta_i/\phi')^2$$

δ_i : angle d'inclinaison de la force résultante par rapport à la verticale, degrés

ϕ' : angle effectif de frottement interne du sol sous la fondation, degrés

Lorsque la charge est excentrique, la semelle doit être modifiée pour en faire une semelle effective à charge concentrique d'une largeur B' et d'une longueur L' , tel que :

$$B' = B - 2e_B, \text{ mais inférieur à } L', \text{ m}$$

$$L' = L - 2e_L, \text{ m}$$

e : excentricité de la charge dans la direction B ou L, m

Nous recommandons d'utiliser les paramètres présentés au tableau 1 dans les calculs ainsi qu'une **largeur effective d'appui du ponceau comme valeur équivalente de la semelle**. Les calculs devront être effectués en condition submergée.

Tableau 1 : Paramètres recommandés pour le calcul de q_{ult}

Paramètre	Valeur ou formulation Remblais (Élévation > 94,0 m)	Valeur ou formulation remblai probable et sols naturels (Élévation ≤ 94,0 m)
Cohésion effective du sol sous la fondation (c') ou cohésion non drainée (c)	25 kPa	40 kPa
Angle de frottement effectif du sol sous la fondation (ϕ')	0°	0°
Pression verticale des terres au niveau de la fondation (q_s) ⁽¹⁾	$\gamma_1 D$ ou $\gamma'_1 D$	$\gamma_1 D$ ou $\gamma'_1 D$
Poids volumique total du sol au-dessus de la base de la fondation (γ_1)	19,5 kN/m ³	19,5 kN/m ³
Poids volumique déjaugé du sol au-dessus de la base de la fondation (γ'_1)	9,5 kN/m ³	9,5 kN/m ³
Poids volumique total du sol sous la fondation (γ) ⁽¹⁾	19,5 kN/m ³	17,5 kN/m ³
Poids volumique déjaugé du sol sous la fondation (γ') ⁽¹⁾	9,5 kN/m ³	7,5 kN/m ³
Coefficients de portance		
N _c	5,1	5,1
N _q	1	1
N _γ	0	0

Note (1) La valeur du poids volumique à utiliser dépend du niveau de l'eau souterraine (voir le CFEM 2006).

La résistance géotechnique pondérée sera obtenue en appliquant un coefficient de tenue égal ou inférieur à 0,5 à la valeur q_{ult} .

2.2 Résistance géotechnique à l'ÉLTS lié au tassement

La pression de tassement aux états limites de tenue en service a été estimée selon les modèles usuels de mécanique des sols. La répartition des contraintes repose sur la théorie de l'élasticité alors que l'estimation des tassements est basée sur un modèle pseudo-élastique dans les sols pulvérulents et sur un modèle de consolidation unidimensionnelle dans les sols cohérents.

Tel que mentionné à la section 1, le forage TF-07-13 a permis de révéler la présence d'une couche silto-argileuse molle entre les élévations 94,8 et 94,0 m (élev. surface = 100,10 m). Cette couche a pour effet de diminuer la portance des sols.

Sur la base de ces observations, dans le cas où l'assise du ponceau repose sur les sols en place à une élévation supérieure à 94,0 m, nous estimons la pression nette de tassement à 50 kPa pour un tassement maximal de 25 mm. Dans le cas où l'assise du ponceau repose sur les sols en place à une élévation égale ou inférieure à 94,0 m, nous estimons la pression nette de tassement à 100 kPa. Nous entendons par pression nette de tassement la contrainte pouvant être ajoutée à la contrainte effective actuelle au niveau de l'assise du ponceau.

3 Excavation et contrôle des eaux souterraines

L'excavation devra être effectuée de sorte que tous les sols en fond de tranchées, et surtout ceux devant recevoir directement l'assise du ponceau en béton armé, soient intacts, exempts de matières organiques, non remaniés et bien drainés. Le remaniement des matériaux en place devra être maintenu au strict minimum, de façon à assurer la validité des contraintes admissibles mentionnées dans le présent rapport et pour minimiser les déformations ultérieures des sols de fondation.

En présence de sols instables, ceux-ci devront être excavés et remplacés par un matériau granulaire de qualité. Des vérifications de fond d'excavation et une surveillance adéquate du remplacement des sols instables en fond d'excavation devront être réalisées par un représentant du laboratoire en contrôle qualitatif.

Des mesures de drainage adéquates devront être prévues afin d'évacuer efficacement les eaux d'infiltration et de ruissellement de manière à maintenir les excavations sèches en tout temps. Dans le cas où les fonds d'excavation seront constitués de sols silto-argileux, il sera très important, et ce, particulièrement lors de travaux avec des conditions météorologiques défavorables, de procéder immédiatement à la mise en place du coussin granulaire ou d'un tapis de béton maigre afin de protéger la surface d'assise contre le remaniement. Évidemment, le détournement temporaire des eaux du cours d'eau devra être prévu au tout début du projet.

Les pentes d'excavation temporaires non supportées demeurent en tout temps la responsabilité de l'entrepreneur. Celui-ci doit s'assurer que les excavations soient profilées de façon sécuritaire. Pour assurer la stabilité des pentes, l'entrepreneur doit excaver les parois à des inclinaisons permettant leur stabilité durant toute la durée des travaux de chantier. Pour les fins d'analyses techniques et économiques par le concepteur, les pentes d'excavation temporaires devraient être inclinées à au plus 1,25 H : 1,0 V.

Il est important de s'assurer de garder une distance au moins égale à la profondeur de l'excavation entre le sommet du talus et la base des piles de matériaux entreposés au chantier. Cette condition doit être respectée en tout temps à moins que des études particulières ne soient effectuées pour chaque cas spécifique.

Pour assurer la stabilité des pentes temporaires, l'entrepreneur doit excaver les parois à des inclinaisons permettant leur stabilité durant toute la durée des travaux de chantier. Une inspection des pentes d'excavation devrait être réalisée par un ingénieur géotechnicien pour valider ou modifier les pentes pratiquées par l'entrepreneur, et ce, immédiatement après avoir atteint le niveau prévu du fond des excavations. Des mesures correctives devront être formulées par l'ingénieur pour assurer la stabilité des pentes pour la durée projetée des travaux. Dans le cas contraire, ou pour des raisons de contingences physiques et/ou économiques, l'entrepreneur doit prévoir l'étañonnement sécuritaire des parois.

4 Assise et remblayage

Compte tenu que le coussin de support du nouveau ponceau reposera en tout ou en partie sur des sols argileux, les opérations de compactage du coussin granulaire mis en place directement sur les sols en place devront être réalisées avec des équipements appropriés afin d'éviter de les déstabiliser.

L'assise et l'enrobage du ponceau devront être effectués conformément aux dessins normalisés préparés par le MTQ (Ouvrages d'art, tome III, chapitre 4, n° 002). La qualité et la mise en place des remblais doivent être conformes aux prescriptions de l'article 11.6.1 du Cahier des charges et devis généraux (CCDG) préparé par les services du ministère des Transports du Québec, édition 2013.

5 Réutilisation des matériaux en place

Les matériaux de remblais pourront être réutilisés s'ils répondent aux exigences stipulées à la section 4. Dans tous les cas, une planche de référence ou des analyses granulométriques sur les matériaux en pile devront être effectuées. De plus, la teneur en eau de ces matériaux doit se situer près de la valeur optimale, de façon à permettre l'atteinte d'un degré de compaction suffisant. Ces matériaux doivent être acceptés par un ingénieur avant leur mise en place. La possibilité de réutiliser les matériaux d'excavation dépendra des conditions climatiques au moment des travaux et des méthodes de travail de l'entrepreneur.

6 Précautions particulières

Tous les matériaux granulaires utilisés pour le remblayage (matériaux récupérés en place ou d'emprunt) devront être de granulométrie conforme au calibre spécifié, selon les exigences stipulées dans la plus récente version du Cahier des charges et devis généraux (CCDG) préparée par les services du MTQ, et être exempts de matières organiques ou de matériaux potentiellement gonflants (shale, schiste pyriteux). Ces matériaux devront faire l'objet d'une acceptation par l'ingénieur, préalablement à leur mise en place.

À moins de recommandations spécifiques, l'excavation devra être effectuée de façon à ce que tous les sols en fond de tranchées et surtout ceux devant recevoir directement des éléments structuraux, soient intacts (non remaniés), exempts de matières organiques et bien drainés.

7 Sensibilité du sol au remaniement

Compte tenu de sa teneur élevée en particules fines, le dépôt argileux sera extrêmement sensible au remaniement causé par les intempéries (pluie, gel et fonte des neiges) ou par la circulation des ouvriers et de la machinerie de chantier. Un remaniement excessif des surfaces d'assise peut entraîner une perte de résistance des sols et, subséquemment, des tassements dépassant l'amplitude prévue.

8 Inspection de chantier

Il est recommandé de faire inspecter les travaux de fondation par un professionnel compétent en géotechnique qui s'assurera que les fondations du ponceau soient placées sur les sols appropriés, capables de supporter les pressions des nouvelles structures dans des conditions sécuritaires.

De plus, il est suggéré que les travaux de remblayage des excavations fassent l'objet d'une surveillance assidue, notamment en s'assurant que le degré de compactage requis soit atteint, puisque le comportement à long terme de la chaussée et des talus dépend dans une large mesure de la qualité et du succès de ces opérations. Cette surveillance permettra également de vérifier que les conditions de sols rencontrées sur le site valident les hypothèses formulées dans ce rapport et de voir à ce que les travaux soient réalisés de façon appropriée.

9 Conditions hivernales

La pénétration du gel dans le sol peut causer des problèmes aux structures. Pendant la construction, les sols de fondation exposés doivent être convenablement protégés contre les effets du gel au moyen de matériaux isolants, tels que de la paille, de l'isolant rigide, des abris chauffés, etc.

Nous espérons que ce rapport réponde entièrement à vos attentes et vous prions d'agréer, Monsieur, l'expression de nos sentiments les meilleurs.



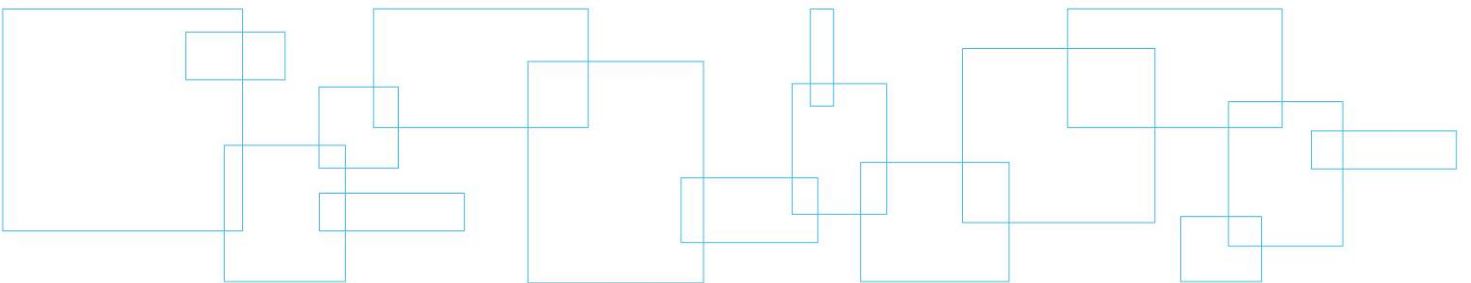
Marie-Eve Lemire, ing., O.I.Q. 129013
Chargée de projet – Géotechnique


2013-09-27

Luc Bertrand, ing., O.I.Q. 102846
Chef d'équipe – Géotechnique

MEL/LB/jb

Annexe 1 Portée de l'étude



PORTÉE DE L'ÉTUDE GÉOTECHNIQUE

1.0 *Caractéristiques des sols et du roc*

Les caractéristiques des sols et du roc décrites dans ce rapport proviennent de forages et/ou de sondages effectués à une période donnée et correspondent à la nature du terrain aux seuls endroits où ces mêmes forages et sondages ont été effectués. Ces caractéristiques peuvent varier de façon importante entre les points de forage et de sondage.

Les formations de sol et de roc présentent une variabilité naturelle. Les limites entre les différentes formations présentées sur les rapports doivent donc être considérées comme des transitions entre les formations plutôt que comme des frontières fixes. La précision de ces limites dépend du type et du nombre de sondages, de la méthode de sondage, de la fréquence et de la méthode d'échantillonnage.

Les descriptions des échantillons prélevés ont été faites selon les méthodes d'identification et de classification reconnues et utilisées en géotechnique. Elles peuvent impliquer le recours au jugement et à l'interprétation du personnel ayant réalisé l'examen des matériaux. Celles-ci peuvent être présumées justes et correctes suivant la pratique courante dans le domaine de la géotechnique. Finalement, si des essais ont été effectués, les résultats de ces essais ne sont valides que pour l'échantillon décrit dans le présent rapport.

Les propriétés des sols et du roc peuvent être modifiées de façon importante à la suite d'activités de construction, telles que l'excavation, le dynamitage, le battage de pieux ou le drainage, effectuées sur le site ou sur un site adjacent. Elles peuvent également être modifiées indirectement par l'exposition des sols ou du roc au gel ou aux intempéries.

2.0 *Eau souterraine*

Les conditions d'eau souterraine présentées dans ce rapport s'appliquent uniquement au site étudié. La précision et la représentation de ces conditions doivent être interprétées en fonction du type d'instrumentation mis en place et de la période, de la durée et du nombre d'observations effectuées. Ces conditions peuvent varier selon les précipitations, les saisons et éventuellement les marées. Elles peuvent également varier à la suite d'activités de construction ou de modifications d'éléments physiques sur le site ou dans le voisinage. La problématique de l'ocre ferreuse et ses effets n'est pas couverte par le présent rapport.

3.0 *Utilisation du rapport*

Les commentaires et recommandations donnés dans ce rapport s'adressent principalement à l'équipe de conception du projet. Pour déterminer toutes les conditions souterraines pouvant affecter les coûts et les techniques de construction, le choix des équipements ainsi que la planification des opérations, le nombre de forages ou de sondages nécessaire pourrait être supérieur au nombre de forages ou sondages effectué pour les besoins de la conception. Les entrepreneurs présentant une soumission ou effectuant les travaux doivent effectuer leur propre interprétation des résultats des forages et des sondages et au besoin leur propre investigation pour déterminer comment les conditions en place peuvent influencer leurs travaux ou leur méthode de travail.

Toute modification de la conception, de la position et de l'élévation des ouvrages devra être communiquée rapidement à LVM de façon à ce que la validité des recommandations présentées puisse être vérifiée. Des travaux complémentaires de terrain ou de laboratoire pourraient éventuellement s'avérer nécessaires.

Le rapport ne doit pas être reproduit, sinon entier, sans l'autorisation de LVM.

4.0 *Suivi du projet*

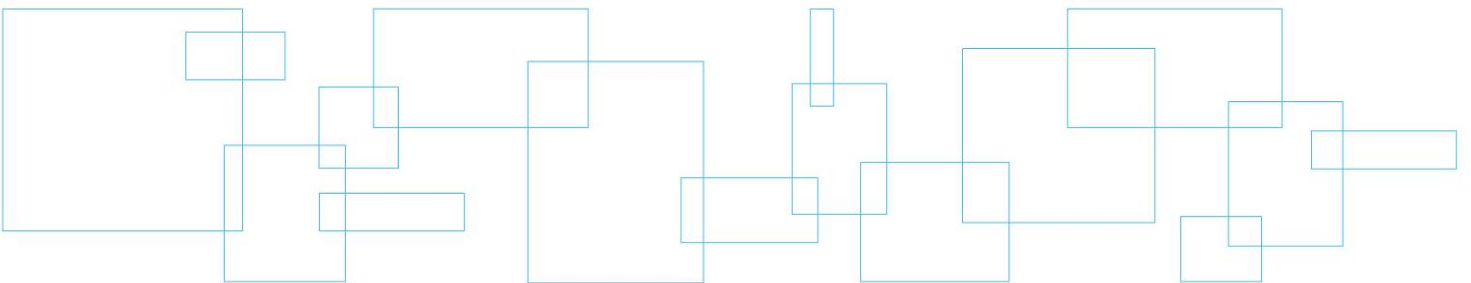
L'interprétation des résultats de chantier et de laboratoire et les recommandations présentées dans ce rapport s'appliquent uniquement au site étudié et aux informations disponibles sur le projet au moment de la rédaction du rapport.

Les informations disponibles sur les conditions de terrain et sur l'eau souterraine augmentent au fur et à mesure de l'avancement des travaux de construction. Les conditions de terrain ayant été interprétées et corrélées entre les points de forage et de sondage, LVM devrait avoir la possibilité de vérifier ces conditions de terrain par des visites de chantier effectuées au fur et à mesure de l'avancement des travaux, afin de confirmer les informations obtenues des forages et sondages. S'il nous est impossible de faire de telles vérifications, LVM n'assurera aucune responsabilité concernant l'interprétation géotechnique que des tiers feront des recommandations de ce rapport, particulièrement si la conception est modifiée ou que des conditions de terrain différentes à celles décrites dans ce rapport sont rencontrées. L'identification de tels changements requiert de l'expérience et doit être effectuée par un ingénieur géotechnicien expérimenté.

5.0 *Environnement*

Les informations contenues dans ce rapport ne couvrent pas les aspects environnementaux des conditions de terrain, ces aspects ne faisant pas partie du mandat d'étude.

**Annexe 2 Note explicative sur les
rapports de sondage
et rapports de forage**



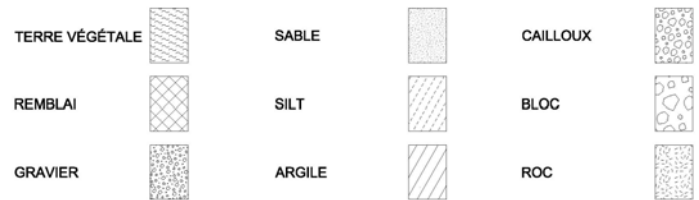
Les rapports de sondage qui font suite à cette note synthétisent les données de chantier et de laboratoire sur les propriétés géotechniques des sols, de la roche et de l'eau souterraine recueillies à chaque sondage. Cette note a pour but d'expliquer les différents symboles et abréviations utilisés dans les rapports de sondage.

STRATIGRAPHIE

Élévation/Profondeur : Dans cette colonne sont inscrites les élévations des contacts géologiques rattachées au niveau de référence mentionné à l'en-tête du rapport de sondage et établies à partir de la surface du terrain mesuré au moment de la réalisation du sondage. Les profondeurs sont également indiquées.

Description des sols et du roc : Chaque formation géologique est décrite selon la terminologie d'usage présentée ci-dessous.

SYMBOLES



NIVEAU D'EAU

Dans cette colonne est indiquée l'élévation du niveau de l'eau souterraine mesurée à la date indiquée. Un schéma présentant le type et la profondeur d'installation est aussi présenté dans cette colonne.

ÉCHANTILLONS

Type et numéro : Chaque échantillon est étiqueté conformément au numéro de cette colonne et la notation donnée réfère au type d'échantillon décrit à l'en-tête du rapport de sondage.

Sous-échantillon : Lorsqu'un échantillon inclut un changement de matière stratigraphique, il est parfois requis de le séparer et de créer des sous-échantillons. Cette colonne permet l'identification de ces derniers et permet l'association des mesures in situ et en laboratoire à ces sous-échantillons.

État : La position, la longueur et l'état de chaque échantillon sont montrés dans cette colonne. Le symbole illustre l'état de l'échantillon suivant la légende donnée à l'en-tête du rapport de sondage.

Calibre : Dans cette colonne est indiqué le calibre de l'échantillonneur.

N et Nb coups/150 mm : L'indice de pénétration standard « N » donné dans cette section est montré dans la colonne correspondante. Cet indice est obtenu de l'essai de pénétration standard et correspond au nombre de coups d'un marteau de 63,5 kilogrammes tombant en chute libre de 0,76 mètre nécessaire pour enfoncer les 300 derniers millimètres du carottier fendu normalisé (ASTM D-1586). Le résultat du nombre de coups obtenu par 150 mm est indiqué dans la colonne Nb coups/150 mm. Pour un carottier de 610 mm de longueur, l'indice N est obtenu en additionnant le nombre de coups nécessaire pour enfoncer les 2^e et 3^e courses de 150 mm d'enfoncement.

RQD : L'indice de qualité de la roche (RQD) est défini comme étant le rapport de la longueur totale de tous les fragments de carottes de 100 millimètres ou plus à la longueur totale de la course. L'indice RQD est présenté en pourcentage.

ESSAIS

Résultats : Dans cette section, les résultats d'essais effectués sur le chantier et au laboratoire sont indiqués à la profondeur correspondante. La définition des symboles rattachés à chaque essai est présentée à l'en-tête du rapport de sondage. Les résultats des essais qui n'apparaissent pas sur le rapport sont présentés en note à la fin du rapport de sondage. Par contre, une abréviation indiquant le type d'analyse réalisée est présentée vis-à-vis l'échantillon analysé.

Graphique : Ce graphique montre la résistance au cisaillement non drainé des sols cohérents mesurée en chantier ou en laboratoire (NQ 2501-200). Il est également utilisé pour les essais de pénétration dynamique (NQ 2501-145). De plus, ce graphique sert à la représentation des résultats de la teneur en eau et des limites d'Atterberg.

Classification

Argile
Silt et argile (non différenciés)
Sable
Gravier
Caillou
Bloc

Dimension des particules

Plus petite que 0,002 mm
plus petite que 0,08 mm
de 0,08 à 5 mm
de 5 à 80 mm
de 80 à 300 mm
plus grande que 300 mm

Terminologie descriptive

« Traces »
« Un peu »
Adjectif (ex. : sableux, silteux)
« Et » (ex. : sable et gravier)

Proportions

1 à 10 %
10 à 20 %
20 à 35 %
35 à 50 %

Compacité des sols granulaires

Très lâche
Lâche
Moyenne ou compacte
Dense
Très dense

Indice « N » de l'essai de pénétration standard, ASTM D-1586 (coups par 300 mm de pénétration)

0 à 4
4 à 10
10 à 30
30 à 50
plus de 50

Consistance des sols cohérents

Très molle
Molle
Moyenne ou ferme
Raide
Très raide
Dure

Résistance au cisaillement non drainé (kPa)

Moins de 12
12 à 25
25 à 50
50 à 100
100 à 200
plus de 200

Plasticité des sols cohérents

Faible
Moyenne
Élevée

Limite de liquidité

Inférieure à 30 %
entre 30 et 50 %
supérieure à 50 %

Sensibilité des sols cohérents

Faible
Moyenne
Forte
Très forte
Argile sensible

S_t=(Cu/Cur)

S_t < 2
2 à 4
4 à 8
8 à 16
S_t > 16

Classification du roc

Très mauvaise qualité
Mauvaise qualité
Qualité moyenne
Bonne qualité
Excellente qualité

RQD (%)

< 25
25 à 50
50 à 75
75 à 90
90 à 100



Client :

Dessau inc.

RAPPORT DE FORAGE

Dossier n°: P-0004134-0-00-300
 Sondage n°: TF-07-13
 Date: 2013-09-11

Projet: Remplacement de ponceaux

Endroit: Ponceau 6 (chaînage 2+010), Parc National de la Mauricie

Coordonnées (m): Nord 5178675.0 (Y)
 Est 669969.0 (X)
MTM NAD 83 Géodésique Élévation **100.10 (Z)**
 Prof. du roc: m Prof. de fin: 11.89 m

État des échantillons

Intact
 Remanié
 Perdu
 Carotte

Examens organoleptiques sur les sols:

Aspect visuel: Inexistant(I); Disséminé(D); Imbibé(IM)
 Odeur: Inexistante(I); Légère(L); Moyenne(M); Persistante(P)

Type d'échantillon

CF Carottier fendu
TM Tube à paroi mince
PS Tube à piston fixe
CR Tube carottier
TA À la tarière
MA À la main
TU Tube transparent
PW Carottier LVM
SG Sol gelé

Abréviations

L Limites de consistance **M.O.** Matière organique (%)
W_L Limite de liquidité (%) **K** Perméabilité (cm/s)
W_p Limite de plasticité (%) **PV** Poids volumique (kN/m³)
I_p Indice de plasticité (%) **A** Absorption (l/min. m)
I_L Indice de liquidité **U** Compression uniaxiale (MPa)
W Teneur en eau (%) **RQD** Indice de qualité du roc (%)
AG Analyse granulométrique **AC** Analyse chimique
S Sédimentométrie **P_L** Pression limite, essai pressiométrique (kPa)
R Refus à l'enfoncement **E_m** Module pressiométrique (MPa)
VBS Valeur au Bleu du sol **E_r** Module de réaction du roc (MPa)
PDT Poids des tiges **SP_o** Potentiel de ségrégation (mm²/H °C)

Niveau d'eau
N Pénétration standard (Nb coups/300mm)
N_c Pénétration dyn. (Nb coups/300mm) ●
σ'_p Pression de préconsolidation (kPa)
TAS Taux d'agressivité des sols

Résistance au cisaillement

C_U Intact (kPa) Chantier
C_{UR} Remanié (kPa) Laboratoire

PROFONDEUR - pi	PROFONDEUR - m	STRATIGRAPHIE				ÉCHANTILLONS							ESSAIS							
		ÉLÉVATION - m	PROF. - m	DESCRIPTION DES SOLS ET DU ROC	SYMBOLS	NIVEAU D'EAU (m) / DATE	TYPE ET NUMÉRO	SOUS-ÉCH.	ÉTAT	CALIBRE	RÉCUPÉRATION %	Nb coups/150mm	"N" ou RQD	Examens organo.	RÉSULTATS	TENEUR EN EAU ET LIMITES (%)				
																W _p	W	W _L		
															RÉSISTANCE AU CISAILEMENT (kPa) OU PÉNÉTRATION DYNAMIQUE					
															20	40	60	80	100	120
															20	40	60	80	100	120
	100.10			Enrobé bitumineux																
1	99.97	0.00		Remblai : sable et gravier à graveleux avec des traces de silt, gris.							16-21 32-8/3cm	53		AC (CF-1B): HP C ₁₀ -C ₅₀ : <A HAP: <A COV: <A Métaux: <A						
2	99.75	0.13		Remblai : sable graveleux avec un peu de silt, brun.							19-20 19-16	39		AC (CF-3): HP C ₁₀ -C ₅₀ : <A Métaux: <A						
3	99.49	0.35		Remblai : sable avec des traces de silt et de gravier, beige-brun. Présence d'une couche de silt argileux, gris, de 1,83 à 1,98m de profondeur.							7-7 7-4	14		AC (CF-4A): HP C ₁₀ -C ₅₀ : <A Métaux: <A						
4	97.05	0.61		Remblai : sable silteux avec des traces d'argile, gris. Présence de petits fragments de béton.							8-18 35-38	53		AC (CF-4A): HP C ₁₀ -C ₅₀ : <A Métaux: <A						
5	96.44	3.05		Remblai : sable et silt à silteux avec des traces d'argile et des traces de gravier concassé, gris.							22-23 26-23	49		W = 17.5						
6	95.60	3.66		Remblai : mélange de silt argileux avec un peu de sable et de gravier, gris.							7-3 8-6	11		W = 19.2						
7	94.77	4.50		Remblai possible : silt argileux avec des traces de sable, gris-brun. Matières organiques et fragments de bois à 5,43m de profondeur.							4-7 7-5	14		W = 48.2 W _L = 50 W _p = 19 W = 39.0						
8	94.00	5.33		Remblai possible : silt argileux avec des traces de sable, ferme, gris-brun à gris. Présence d'un fragment de bois à 6,25m et 6,86m. Présence d'un gros gravier dans l'échantillon TM-13.							0-1 1-1	2		C _U = 42 kPa C _{UR} = 28 kPa L W = 37.4 W _L = 53 W _p = 18						
9	92.48	7.62		Sol naturel : silt argileux avec des traces de sable, gris foncé, raide à très raide. Présence de lits de sable.							1-2 2-3	4		C _U = 77 kPa C _{UR} = 7 kPa W = 32.9						
10											1-1 2-2	3								

Remarques: - CF-7: Aucune récupération avec la cuillère de calibre B, reprise de l'échantillon avec une cuillère de calibre N et récupération de 75%.

Type de forage: Tubage

Équipement de forage: Diedrich D-50

Préparé par: J.-P. Fecteau, tech.

Vérifié par: M.-E. Lemire, ing.

2013-09-26

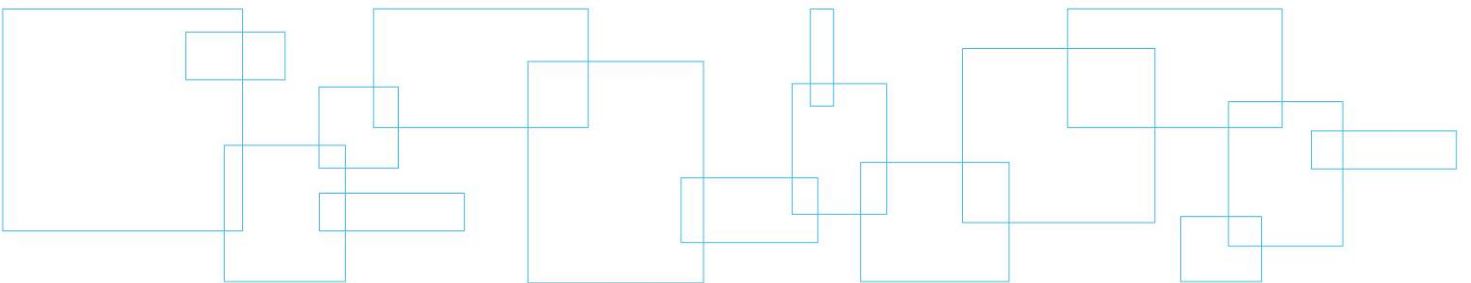
Page: 1 de 2

		Client : Dessau inc.				RAPPORT DE FORAGE													
						Dossier n°: P-0004134-0-00-300 Sondage n°: TF-07-13 Date: 2013-09-11													
Projet: Remplacement de ponceaux						Coordonnées (m): Nord 5178675.0 (Y) Est 669969.0 (X)													
Endroit: Ponceau 6 (chaînage 2+010), Parc National de la Mauricie						MTM NAD 83 Géodésique		Élévation 100.10 (Z) Prof. du roc: m Prof. de fin: 11.89 m											
STRATIGRAPHIE			ÉCHANTILLONS					ESSAIS											
PROFONDEUR - pi	PROFONDEUR - m	ÉLÉVATION - m PROF. - m	DESCRIPTION DES SOLS ET DU ROC	SYMBOLES	NIVEAU D'EAU (m) / DATE	TYPE ET NUMÉRO	SOUS-ÉCH.	ÉTAT	CALIBRE	RÉCUPÉRATION %	Nb coups/150mm	"N" ou RGD	Examens organo.		RÉSULTATS	TENEUR EN EAU ET LIMITES (%)			
													Odeur	Visuel		Wp	W	Wl	
35																			
36	11					CF-16		X	B	100	1-1 2-3	3							
37						TM-17		/	B	100									
38																			
39		88.21 11.89	Fin du forage à une profondeur de 11,89m.																
40	12																		
41																			
42																			
43	13																		
44																			
45																			
46	14																		
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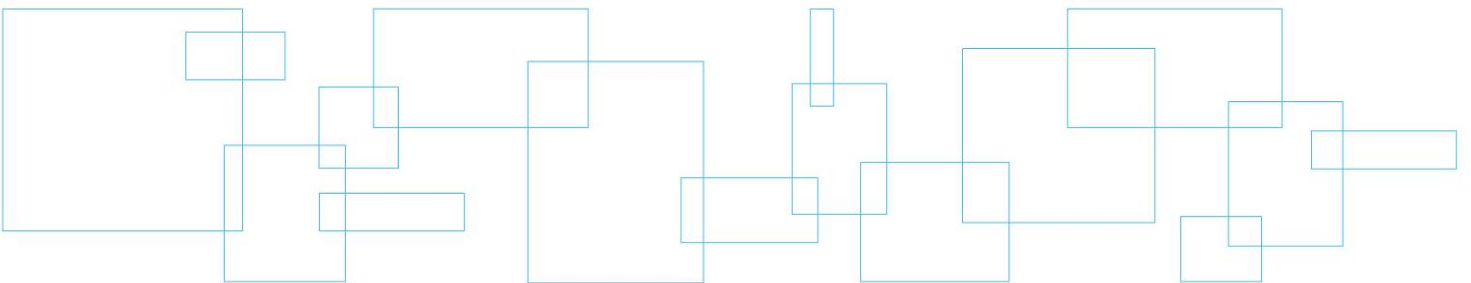
Remarques: - CF-7: Aucune récupération avec la cuillère de calibre B, reprise de l'échantillon avec une cuillère de calibre N et récupération de 75%.

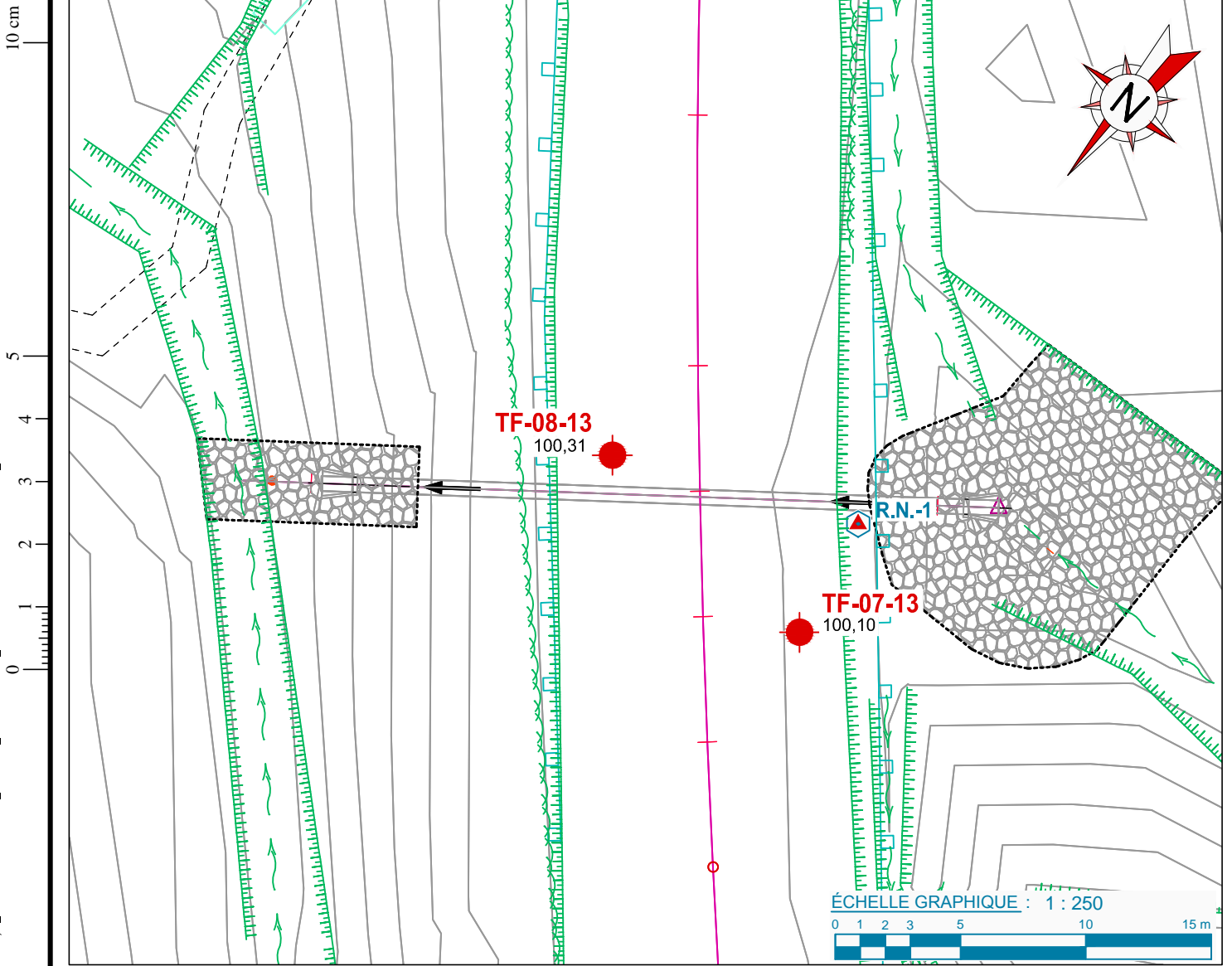
		Client : Dessau inc.	RAPPORT DE FORAGE Dossier n°: P-0004134-0-00-300 Sondage n°: TF-08-13 Date: 2013-09-13															
Projet: Remplacement de ponceaux Endroit: Ponceau 6 (chaînage 2+010), Parc National de la Mauricie			Coordonnées (m): Nord 5178673.0 (Y) Est 669701.0 (X) MTM NAD 83 Géodésique Élévation 100.31 (Z) Prof. du roc: m Prof. de fin: 11.89 m															
STRATIGRAPHIE			ÉCHANTILLONS				ESSAIS											
PROFONDEUR - pi	PROFONDEUR - m	ÉLÉVATION - m	PROF. - m	DESCRIPTION DES SOLS ET DU ROC	SYMBOLES	NIVEAU D'EAU (m) / DATE	TYPE ET NUMÉRO	SOUS-ÉCH.	ÉTAT	CALIBRE	RÉCUPÉRATION %	Nb coups/150mm	"N" ou RGD	Examens organo.	Odeur	Visuel	RÉSULTATS	TENEUR EN EAU ET LIMITES (%)
Teneur en eau et limites (%): Wp, W, WL Résistance au cisaillement (kPa) ou pénétration dynamique: 20, 40, 60, 80, 100, 120, 140, 160, 180																		
35																		
36	-11						TM-14		▨	B	100							
37							CF-15		⊗	B	100	1-2 2-2	4					
38		88.42		Fin du forage à une profondeur de 11,89m.														
39	-12	11.89																
40																		
41																		
42																		
43	-13																	
44																		
45																		
46	-14																	
47																		
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49	-15																	
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82	-25																	
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85																		
Remarques: - CF-7: Aucune récupération avec la cuillère de calibre B, reprise de l'échantillon avec une cuillère de calibre N et récupération de 42%.																		
Type de forage: Tubage						Équipement de forage: Diedrich D-50												
Préparé par: J.-P. Fecteau, tech.						Vérifié par: M.-E. Lemire, ing.						2013-09-26		Page: 2 de 2				

Annexe 3 Résultats des essais en laboratoire




Annexe 4 Croquis de localisation des forages





LÉGENDE :

TF-NN-AA
 00,00 FORAGE-NUMÉRO-ANNÉE
 ÉLÉVATION (m)

**COORDONNÉES DES SONDAGES-UTM
 Nad83 FUSEAU 18**

N° SONDAGE	NORD (Y)	EST (X)	ÉLÉVATION
TF-07-13	5 178 675,0	669 969,0	100,10
TF-08-13	5 178 673,0	669 701,0	100,31

- NOTES :**
- RÉFÉRENCES : LE FOND DE PLAN PROVIENT D'UN EXTRAIT TIRÉ D'UN PLAN ÉMIS PAR DESSAU inc. : 056P0004134300VR_CV3D_PNC006.dwg.
 - LE REPÈRE DE NIVELLEMENT R.N.-1 EST MATÉRIALISÉ PAR UN CLOU. UNE ÉLÉVATION ARBITRAIRE DE 100,0m LUI A ÉTÉ ATTRIBUÉ

Ce document doit être utilisé
 conjointement avec les recommandations
 géotechniques

CE DOCUMENT D'INGÉNIERIE EST LA PROPRIÉTÉ DE LVM ET EST PROTÉGÉ PAR LA LOI. IL EST DESTINÉ EXCLUSIVEMENT AUX FINS QUI Y SONT MENTIONNÉES. TOUTE REPRODUCTION OU ADAPTATION, PARTIELLE OU TOTALE, EN EST STRICTEMENT PROHIBÉE SANS AVOIR PRÉALABLEMENT OBTENU L'AUTORISATION ÉCRITE DE LVM.

Projet

REMPLACEMENT DE PONCEAUX

PONCEAU N° 006 (CHAÎNAGE 2+010), PARC NATIONAL DE LA MAURICIE

Titre

LOCALISATION DES FORAGES

LVM inc.

2729, avenue Saint-Marc
 Shawinigan (Québec) G9N 2K6
 Téléphone : 819.539.8900
 Télécopieur : 819.539.1834

Préparé M.-È. Lemire	Discipline GÉOTECHNIQUE	Chargé de projet M.-È. Lemire
Dessiné F. Longval	Échelle 1 : 250	Extrait de: Rév.:
Vérifié M.-È. Lemire	Date 2013-09-24	

Serv. resp.	Projet	Otp	Disc.	Type	N° Dessin	Rév.
075	P-0004134	0 00 300	GE	D	0004	00



Le 25 septembre 2013

Monsieur Serge Alarie

DESSAU

1060, rue University, bureau 600

Montréal (Québec) H3B 4V3

Objet : Recommandations géotechniques

Remplacement du ponceau 137, chaînage 45+187

Parc National de la Mauricie (Québec)

N/Réf. : 056-P-0004134-0-00-300-GE-0002-00

Monsieur,

Les services professionnels de LVM ont été retenus par *Dessau inc.* afin d'effectuer des recommandations géotechniques dans le cadre du projet de remplacement du ponceau 137 situé au chaînage 45+187 dans le Parc National de la Mauricie.

1 Résumé du projet et des conditions de terrain

Le ponceau 137 existant, situé au chaînage 45+187, est un tuyau en tôle ondulé galvanisé (TTOG) d'un diamètre de 1 200 mm dont le radier est situé à environ 4,3 m sous le niveau de la chaussée actuelle. Celui-ci sera remplacé par un tuyau en béton armé de 1200 mm de diamètre. La longueur présumée du nouveau ponceau sera la même que le ponceau existant soit 40,5 m.

Les faibles récupérations notées lors de la réalisation des forages dues à la nature grossière des matériaux rendent difficiles la détermination précise de la granulométrie des remblais.

Les remblais traversés au droit du forage TF-01-13, réalisé à environ 3,5 m en retrait de l'axe du ponceau, seraient constitués d'un mélange de blocs, cailloux, gravier et sable de calibre 0-300 mm; il est cependant possible que des blocs plus gros soient présents. Le socle rocheux y est rencontré à partir de 4,3 m de profondeur, soit à l'élévation:356,5 m. Le roc est composé d'un gneiss gris de bonne qualité.

Le forage TF-02-13, réalisé à environ 12 m en retrait de l'axe du ponceau, révèle la présence de 5,0 m de remblais moins grossiers constitués de sable graveleux et silteux à des traces de silt. La partie inférieure des remblais est composée de sable grossier très lâche contenant des matières organiques et des racines. Les remblais reposent sur une couche de 400 mm de sol organique brun foncé et compressible. Les sols naturels sous-jacents sont denses et constitués d'un sable avec des traces de silt prenant appui sur le roc à 5,6 m de profondeur soit à l'élévation 354,4 m. Le roc est composé d'un gneiss gris de qualité bonne à excellente.

Sur la base de ces observations et en interpolant le profil du roc entre les deux forages, il est probable que le ponceau repose en tout ou en partie sur le socle rocheux.

Lors de la réalisation des forages, le niveau des eaux souterraines relevé dans le tube installé dans chacun des forages se situait soit au niveau du roc et à la base du ponceau actuel c'est-à-dire à 4,3 m dans le cas du forage TF-01-13 où le roc, soit à une profondeur de l'ordre de 5 m au forage TF-02-13, soit légèrement au-dessus du socle rocheux observé à cet endroit.

Basés sur les données disponibles du projet et sur les résultats obtenus à l'emplacement des sondages (de même que lors des essais de laboratoire), nos recommandations et commentaires géotechniques pour la conception du projet sont présentés aux sections suivantes.

2 Calculs aux états limites

Les recommandations qui suivent sont présentées conformément aux directives du « Code canadien sur le calcul des ponts routiers » (CAN/SCA-S6-06) qui exige que le calcul des fondations soit réalisé selon les calculs aux états limites. Ceux-ci se subdivisent en deux groupes : les états limites ultimes (ÉLU) et les états limites d'utilisation (ÉLTS). Les états limites ultimes portent principalement sur les mécanismes d'effondrement de la structure et portent donc sur la sécurité, tandis que les états limites d'utilisation correspondent aux mécanismes qui limitent ou empêchent l'usage prévu de la structure.

Les états limites calculés dans le cadre des travaux de remplacement du ponceau à l'étude sont les suivants :

- ▶ La résistance géotechnique à l'ÉLU (capacité portante);
- ▶ La réaction géotechnique à l'ÉLTS (tassement).

2.1 Résistance géotechnique à l'ÉLU à la capacité portante

La résistance géotechnique à l'ÉLU des fondations superficielles peut être évaluée à partir de la formule suivante provenant du code CAN/CSA-S6-06 :

$$q_{ult} = c N_c s_c i_c + q' N_q s_q i_q + 0,5 \gamma' B N_\gamma s_\gamma i_\gamma$$

où:	c	:	cohésion du sol sous la fondation, kPa
	q'	:	pression effective des terres au niveau de la fondation (= γ_1), kPa
	γ_1	:	poids volumique du sol au-dessus de la fondation, kN/m ³
	D	:	encastrement de la fondation, m
	γ	:	poids volumique total ou effectif du sol sous la fondation, kN/m ³
	s_c, s_q, s_γ	:	coefficients de forme selon la géométrie de la semelle :
			$s_c = s_q = 1 + (B'/L') (N_q/N_c)$
			$s_\gamma = 1 - 0,4 (B'/L')$

- i_c, i_q, i_γ : coefficients d'inclinaison tenant compte de l'inclinaison de la charge :
- $$i_c = i_q = (1 - \delta_i/90^\circ)^2$$
- $$i_\gamma = (1 - \delta_i/\phi')^2$$
- δ_i : angle d'inclinaison de la force résultante par rapport à la verticale, degrés
- ϕ' : angle effectif de frottement interne du sol sous la fondation, degrés

Lorsque la charge est excentrique, la semelle doit être modifiée pour en faire une semelle effective à charge concentrique d'une largeur B' et d'une longueur L' , tel que :

$$B' = B - 2e_B, \text{ mais inférieur à } L', \text{ m}$$

$$L' = L - 2e_L, \text{ m}$$

e : excentricité de la charge dans la direction B ou L, m

Dans le cas où le ponceau reposerait directement sur le socle rocheux, la valeur de l'état limite ultime lié à la capacité portante est de 3 000 kPa.

Dans le cas où le ponceau reposerait sur les sols sableux denses, nous recommandons d'utiliser les paramètres présentés au tableau 1 dans les calculs ainsi qu'une **largeur effective d'appui du ponceau comme valeur équivalente de la semelle**. Les calculs devront être effectués en condition submergée.

Tableau 1 : Paramètres recommandés pour le calcul de q_{ult}

Paramètre	Valeur ou formulation
Cohésion effective du sol sous la fondation (c') ou cohésion non drainée (c)	0
Angle de frottement effectif du sol sous la fondation (ϕ')	32°
Pression verticale des terres au niveau de la fondation (q_s) ⁽¹⁾	$\gamma_1 D$ ou $\gamma'_1 D$
Poids volumique total du sol au-dessus de la base de la fondation (γ_1)	20 kN/m ³
Poids volumique déjaugé du sol au-dessus de la base de la fondation (γ'_1)	10 kN/m ³
Poids volumique total du sol sous la fondation (γ) ⁽¹⁾	20 kN/m ³
Poids volumique déjaugé du sol sous la fondation (γ') ⁽¹⁾	10 kN/m ³
Coefficients de portance	
N_c	35
N_q	23
N_γ	12

Note ⁽¹⁾ La valeur du poids volumique à utiliser dépend du niveau de l'eau souterraine (voir le CFEM 2006).

La résistance géotechnique pondérée sera obtenue en appliquant un coefficient de tenue égal ou inférieur à 0,5 à la valeur q_{ult} .

2.2 Résistance géotechnique à l'ÉLTS lié au tassement

La pression de tassement aux états limites de tenue en service a été estimée selon les modèles usuels de mécanique des sols. La répartition des contraintes repose sur la théorie de l'élasticité alors que l'estimation des tassements est basée sur un modèle pseudo-élastique dans les sols pulvérulents et sur un modèle de consolidation unidimensionnelle dans les sols cohérents.

Dans le cas où le ponceau reposerait directement sur le socle rocheux, une capacité portante admissible (ou état limite de tenue en service) de 1 000 kPa pourra être utilisée par le concepteur dans le calcul des fondations. Les tassements anticipés sous cette charge seront négligeables.

Dans le cas où le ponceau reposerait sur les sols naturels denses, non-remaniés et exempts de matières organiques, nous estimons la pression nette de tassement à 500 kPa pour un tassement maximal de 25 mm. Nous entendons par pression nette de tassement la contrainte pouvant être ajoutée à la contrainte effective actuelle au niveau de l'assise du ponceau.

3 Excavation et contrôle des eaux souterraines

L'excavation devra être effectuée de sorte que tous les sols en fond de tranchées, et surtout ceux devant recevoir directement l'assise du ponceau en béton armé, soient intacts, exempts de matières organiques, non remaniés et bien drainés. **Il sera important de retirer la couche de sol organique compressible si elle est rencontrée.** Le remaniement des matériaux en place devra être maintenu au strict minimum, de façon à assurer la validité des contraintes admissibles mentionnées dans le présent rapport et pour minimiser les déformations ultérieures des sols de fondation.

En présence de sols instables, ceux-ci devront être excavés et remplacés par un matériau granulaire de qualité. Des vérifications de fond d'excavation et une surveillance adéquate du remplacement des sols instables en fond d'excavation devront être réalisées par un représentant du laboratoire en contrôle qualitatif.

Des mesures de drainage adéquates devront être prévues afin d'évacuer efficacement les eaux d'infiltration et de ruissellement de manière à maintenir les excavations sèches en tout temps. Évidemment, le détournement temporaire des eaux du cours d'eau devra être prévu au tout début du projet.

Les pentes d'excavation temporaires non supportées demeurent en tout temps la responsabilité de l'entrepreneur. Celui-ci doit s'assurer que les excavations soient profilées de façon sécuritaire. Pour assurer la stabilité des pentes, l'entrepreneur doit excaver les parois à des inclinaisons permettant leur stabilité durant toute la durée des travaux de chantier. Pour les fins d'analyses techniques et économiques par le concepteur, les pentes d'excavation temporaires devraient être inclinées à au plus 1,5 H : 1,0 V. Quant aux parois exposées à l'intérieur du roc, s'il y a lieu, elles peuvent être de l'ordre de 1,0 H : 10,0 V **à la condition que tous les fragments lâches, ébranlés ou susceptibles de se détacher soient retirés.** Un palier d'environ 0,3 m de largeur doit être aménagé au contact des sols et du roc, afin de prévenir la chute de gravier ou de cailloux vers l'intérieur de l'excavation.

Il est important de s'assurer de garder une distance au moins égale à la profondeur de l'excavation entre le sommet du talus et la base des piles de matériaux entreposés au chantier. Cette condition doit être respectée en tout temps à moins que des études particulières ne soient effectuées pour chaque cas spécifique.

Pour assurer la stabilité des pentes temporaires, l'entrepreneur doit excaver les parois à des inclinaisons permettant leur stabilité durant toute la durée des travaux de chantier. Une inspection des pentes d'excavation devrait être réalisée par un ingénieur géotechnicien pour valider ou modifier les pentes pratiquées par l'entrepreneur, et ce, immédiatement après avoir atteint le niveau prévu du fond des excavations. Des mesures correctives devront être formulées par l'ingénieur pour assurer la stabilité des pentes pour la durée projetée des travaux. Dans le cas contraire, ou pour des raisons de contingences physiques et/ou économiques, l'entrepreneur doit prévoir l'étañonnement sécuritaire des parois.

4 Assise et remblayage

Le coussin de support du nouveau ponceau reposera directement sur le roc.

L'assise et l'enrobage du ponceau devront être effectués conformément aux dessins normalisés préparés par le MTQ (Ouvrages d'art, tome III, chapitre 4, n° 002). La qualité et la mise en place des remblais doivent être conformes aux prescriptions de l'article 11.6.1 du Cahier des charges et devis généraux (CCDG) préparé par les services du ministère des Transports du Québec, édition 2013.

Si les pentes des talus extérieurs doivent s'établir à 1,5H : 1,0V tel que mesurées par le client, le niveau de compactage des remblais de masse doit être d'au moins 95 % de la masse volumique maximale déterminée en laboratoire selon l'essai à énergie de compactage modifié (Proctor modifié), ou d'au moins 98 % de la planche de référence réalisée en chantier si applicable, le tout accepté par le surveillant du laboratoire de contrôle qualitatif.

5 Réutilisation des matériaux en place

Les matériaux en place pourront être réutilisés s'ils répondent aux exigences stipulés à la section 4. Dans tous les cas, une planche de référence ou des analyses granulométriques, sur les matériaux en pile, devront être effectuées. De plus, la teneur en eau de ces matériaux doit se situer près de la valeur optimale, de façon à permettre l'atteinte d'un degré de compaction suffisant. Ces matériaux doivent être acceptés par un ingénieur avant leur mise en place. La possibilité de réutiliser les matériaux d'excavation dépendra des conditions climatiques au moment des travaux et des méthodes de travail de l'entrepreneur.

6 Précautions particulières

Tous les matériaux granulaires utilisés pour le remblayage (matériaux récupérés en place ou d'emprunt) devront être de granulométrie conforme au calibre spécifié, selon les exigences stipulées dans la plus récente version du Cahier des charges et devis généraux (CCDG) préparée par les services du MTQ, et être exempts de matières organiques. Ces matériaux devront faire l'objet d'une acceptation par l'ingénieur, préalablement à leur mise en place.

À moins de recommandations spécifiques, l'excavation devra être effectuée de façon à ce que tous les sols naturels en fond de tranchées et surtout ceux devant recevoir directement des éléments structuraux, soient intacts (non remaniés), exempts de matières organiques et bien drainés.

7 Inspection de chantier

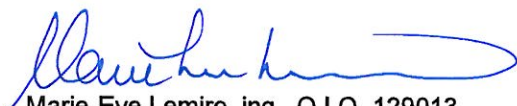
Il est recommandé de faire inspecter les travaux de fondation par un professionnel compétent en géotechnique qui s'assurera que les fondations du ponceau soient placées sur les sols appropriés, capables de supporter les pressions des nouvelles structures dans des conditions sécuritaires.

De plus, il est suggéré que les travaux de remblayage des excavations fassent l'objet d'une surveillance assidue, notamment en s'assurant que le degré de compactage requis soit atteint, puisque le comportement à long terme de la chaussée et des talus dépend dans une large mesure de la qualité et du succès de ces opérations. Cette surveillance permettra également de vérifier que les conditions de sols rencontrées sur le site valident les hypothèses formulées dans ce rapport et de voir à ce que les travaux soient réalisés de façon appropriée.

8 Conditions hivernales

La pénétration du gel dans le sol peut causer des problèmes aux structures. Pendant la construction, les sols de fondation exposés doivent être convenablement protégés contre les effets du gel au moyen de matériaux isolants, tels que de la paille, de l'isolant rigide, des abris chauffés, etc.

Nous espérons que ce rapport réponde entièrement à vos attentes et vous prions d'agréer, Monsieur, l'expression de nos sentiments les meilleurs.



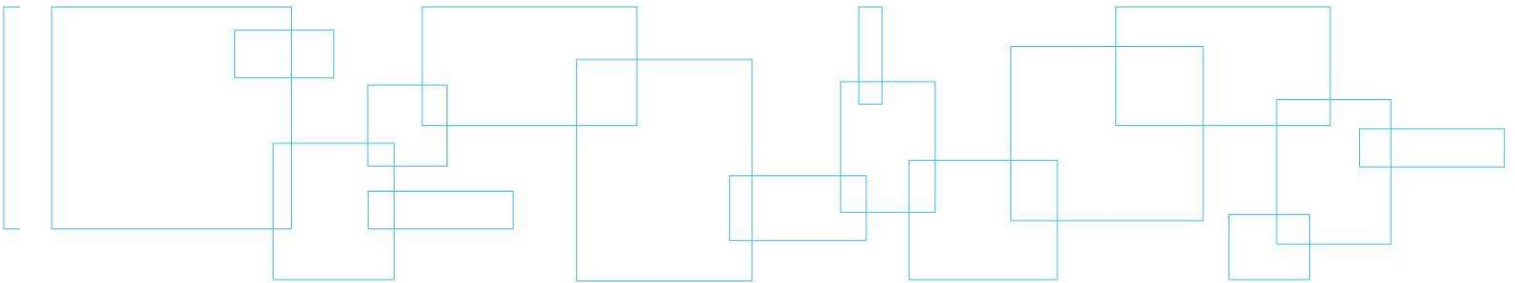
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Annexe 1 Portée de l'étude



PORTÉE DE L'ÉTUDE GÉOTECHNIQUE

1.0 *Caractéristiques des sols et du roc*

Les caractéristiques des sols et du roc décrites dans ce rapport proviennent de forages et/ou de sondages effectués à une période donnée et correspondent à la nature du terrain aux seuls endroits où ces mêmes forages et sondages ont été effectués. Ces caractéristiques peuvent varier de façon importante entre les points de forage et de sondage.

Les formations de sol et de roc présentent une variabilité naturelle. Les limites entre les différentes formations présentées sur les rapports doivent donc être considérées comme des transitions entre les formations plutôt que comme des frontières fixes. La précision de ces limites dépend du type et du nombre de sondages, de la méthode de sondage, de la fréquence et de la méthode d'échantillonnage.

Les descriptions des échantillons prélevés ont été faites selon les méthodes d'identification et de classification reconnues et utilisées en géotechnique. Elles peuvent impliquer le recours au jugement et à l'interprétation du personnel ayant réalisé l'examen des matériaux. Celles-ci peuvent être présumées justes et correctes suivant la pratique courante dans le domaine de la géotechnique. Finalement, si des essais ont été effectués, les résultats de ces essais ne sont valides que pour l'échantillon décrit dans le présent rapport.

Les propriétés des sols et du roc peuvent être modifiées de façon importante à la suite d'activités de construction, telles que l'excavation, le dynamitage, le battage de pieux ou le drainage, effectuées sur le site ou sur un site adjacent. Elles peuvent également être modifiées indirectement par l'exposition des sols ou du roc au gel ou aux intempéries.

2.0 *Eau souterraine*

Les conditions d'eau souterraine présentées dans ce rapport s'appliquent uniquement au site étudié. La précision et la représentation de ces conditions doivent être interprétées en fonction du type d'instrumentation mis en place et de la période, de la durée et du nombre d'observations effectuées. Ces conditions peuvent varier selon les précipitations, les saisons et éventuellement les marées. Elles peuvent également varier à la suite d'activités de construction ou de modifications d'éléments physiques sur le site ou dans le voisinage. La problématique de l'ocre ferreuse et ses effets n'est pas couverte par le présent rapport.

3.0 *Utilisation du rapport*

Les commentaires et recommandations donnés dans ce rapport s'adressent principalement à l'équipe de conception du projet. Pour déterminer toutes les conditions souterraines pouvant affecter les coûts et les techniques de construction, le choix des équipements ainsi que la planification des opérations, le nombre de forages ou de sondages nécessaire pourrait être supérieur au nombre de forages ou sondages effectué pour les besoins de la conception. Les entrepreneurs présentant une soumission ou effectuant les travaux doivent effectuer leur propre interprétation des résultats des forages et des sondages et au besoin leur propre investigation pour déterminer comment les conditions en place peuvent influencer leurs travaux ou leur méthode de travail.

Toute modification de la conception, de la position et de l'élévation des ouvrages devra être communiquée rapidement à LVM de façon à ce que la validité des recommandations présentées puisse être vérifiée. Des travaux complémentaires de terrain ou de laboratoire pourraient éventuellement s'avérer nécessaires.

Le rapport ne doit pas être reproduit, sinon entier, sans l'autorisation de LVM.

4.0 *Suivi du projet*

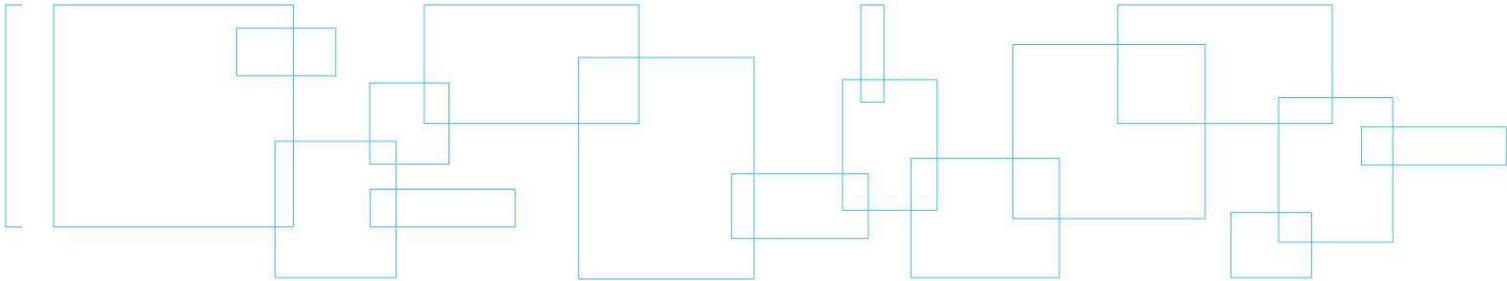
L'interprétation des résultats de chantier et de laboratoire et les recommandations présentées dans ce rapport s'appliquent uniquement au site étudié et aux informations disponibles sur le projet au moment de la rédaction du rapport.

Les informations disponibles sur les conditions de terrain et sur l'eau souterraine augmentent au fur et à mesure de l'avancement des travaux de construction. Les conditions de terrain ayant été interprétées et corrélées entre les points de forage et de sondage, LVM devrait avoir la possibilité de vérifier ces conditions de terrain par des visites de chantier effectuées au fur et à mesure de l'avancement des travaux, afin de confirmer les informations obtenues des forages et sondages. S'il nous est impossible de faire de telles vérifications, LVM n'assurera aucune responsabilité concernant l'interprétation géotechnique que des tiers feront des recommandations de ce rapport, particulièrement si la conception est modifiée ou que des conditions de terrain différentes à celles décrites dans ce rapport sont rencontrées. L'identification de tels changements requiert de l'expérience et doit être effectuée par un ingénieur géotechnicien expérimenté.

5.0 *Environnement*

Les informations contenues dans ce rapport ne couvrent pas les aspects environnementaux des conditions de terrain, ces aspects ne faisant pas partie du mandat d'étude.

**Annexe 2 Note explicative sur les
rapports de sondage
et rapports de forage**



Les rapports de sondage qui font suite à cette note synthétisent les données de chantier et de laboratoire sur les propriétés géotechniques des sols, de la roche et de l'eau souterraine recueillies à chaque sondage. Cette note a pour but d'expliquer les différents symboles et abréviations utilisés dans les rapports de sondage.

STRATIGRAPHIE

Élévation/Profondeur : Dans cette colonne sont inscrites les élévations des contacts géologiques rattachées au niveau de référence mentionné à l'en-tête du rapport de sondage et établies à partir de la surface du terrain mesuré au moment de la réalisation du sondage. Les profondeurs sont également indiquées.

Description des sols et du roc : Chaque formation géologique est décrite selon la terminologie d'usage présentée ci-dessous.

SYMBOLES

TERRE VÉGÉTALE	SABLE	CAILLOUX
REMBLAI	SILT	BLOC
GRAVIER	ARGILE	ROC

NIVEAU D'EAU

Dans cette colonne est indiquée l'élévation du niveau de l'eau souterraine mesurée à la date indiquée. Un schéma présentant le type et la profondeur d'installation est aussi présenté dans cette colonne.

ÉCHANTILLONS

Type et numéro : Chaque échantillon est étiqueté conformément au numéro de cette colonne et la notation donnée réfère au type d'échantillon décrit à l'en-tête du rapport de sondage.

Sous-échantillon : Lorsqu'un échantillon inclut un changement de matière stratigraphique, il est parfois requis de le séparer et de créer des sous-échantillons. Cette colonne permet l'identification de ces derniers et permet l'association des mesures in situ et en laboratoire à ces sous-échantillons.

État : La position, la longueur et l'état de chaque échantillon sont montrés dans cette colonne. Le symbole illustre l'état de l'échantillon suivant la légende donnée à l'en-tête du rapport de sondage.

Calibre : Dans cette colonne est indiqué le calibre de l'échantillonneur.

N et Nb coups/150 mm : L'indice de pénétration standard « N » donné dans cette section est montré dans la colonne correspondante. Cet indice est obtenu de l'essai de pénétration standard et correspond au nombre de coups d'un marteau de 63,5 kilogrammes tombant en chute libre de 0,76 mètre nécessaire pour enfoncer les 300 derniers millimètres du carottier fendu normalisé (ASTM D-1586). Le résultat du nombre de coups obtenu par 150 mm est indiqué dans la colonne Nb coups/150 mm. Pour un carottier de 610 mm de longueur, l'indice N est obtenu en additionnant le nombre de coups nécessaire pour enfoncer les 2^e et 3^e courses de 150 mm d'enfoncement.

RQD : L'indice de qualité de la roche (RQD) est défini comme étant le rapport de la longueur totale de tous les fragments de carottes de 100 millimètres ou plus à la longueur totale de la course. L'indice RQD est présenté en pourcentage.

ESSAIS

Résultats : Dans cette section, les résultats d'essais effectués sur le chantier et au laboratoire sont indiqués à la profondeur correspondante. La définition des symboles rattachés à chaque essai est présentée à l'en-tête du rapport de sondage. Les résultats des essais qui n'apparaissent pas sur le rapport sont présentés en note à la fin du rapport de sondage. Par contre, une abréviation indiquant le type d'analyse réalisée est présentée vis-à-vis l'échantillon analysé.

Graphique : Ce graphique montre la résistance au cisaillement non drainé des sols cohérents mesurée en chantier ou en laboratoire (NQ 2501-200). Il est également utilisé pour les essais de pénétration dynamique (NQ 2501-145). De plus, ce graphique sert à la représentation des résultats de la teneur en eau et des limites d'Atterberg.

Classification

Argile
Silt et argile (non différenciés)
Sable
Gravier
Caillou
Bloc

Dimension des particules

Plus petite que 0,002 mm
plus petite que 0,08 mm
de 0,08 à 5 mm
de 5 à 80 mm
de 80 à 300 mm
plus grande que 300 mm

Terminologie descriptive

« Traces »
« Un peu »
Adjectif (ex. : sableux, silteux)
« Et » (ex. : sable et gravier)

Proportions

1 à 10 %
10 à 20 %
20 à 35 %
35 à 50 %

Compacité des sols granulaires

Très lâche
Lâche
Moyenne ou compacte
Dense
Très dense

Indice « N » de l'essai de pénétration standard, ASTM D-1586 (coups par 300 mm de pénétration)

0 à 4
4 à 10
10 à 30
30 à 50
plus de 50

Consistance des sols cohérents

Très molle
Molle
Moyenne ou ferme
Raide
Très raide
Dure

Résistance au cisaillement non drainé (kPa)

Moins de 12
12 à 25
25 à 50
50 à 100
100 à 200
plus de 200

Plasticité des sols cohérents

Faible
Moyenne
Élevée

Limite de liquidité

Inférieure à 30 %
entre 30 et 50 %
supérieure à 50 %

Sensibilité des sols cohérents

Faible
Moyenne
Forte
Très forte
Argile sensible

S_t=(Cu/Cur)

S_t < 2
2 à 4
4 à 8
8 à 16
S_t > 16





Classification du roc

Très mauvaise qualité
Mauvaise qualité
Qualité moyenne
Bonne qualité
Excellente qualité

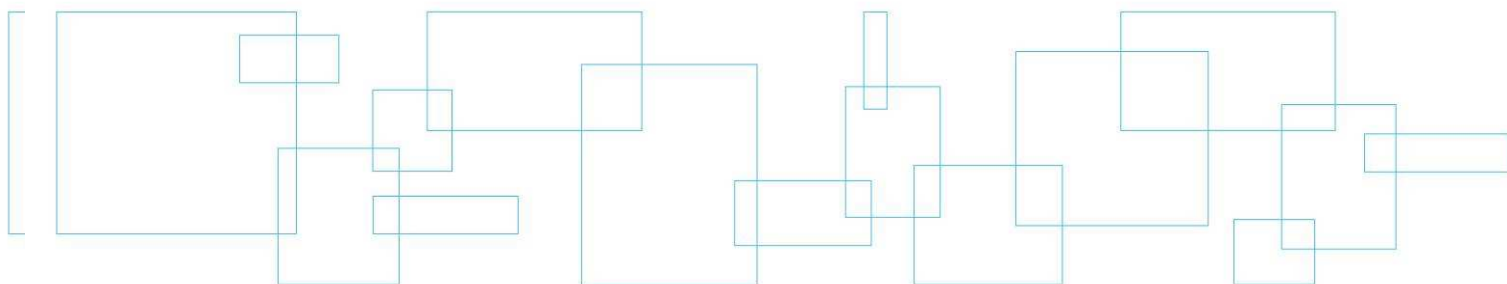
RQD (%)

< 25
25 à 50
50 à 75
75 à 90
90 à 100

LVM		Client : Dessau inc.		RAPPORT DE FORAGE										
Projet: Remplacement de ponceaux		Coordonnées (m): Nord 5175005,3 (Y)		Dossier n°: P-0004134-0-00-300										
Endroit: Ponceau 137 (chaînage 45+187), Parc National de la Mauricie		UTM Nad83 Est 649539,1 (X)		Sondage n°: TF-01-13										
		Fus.18 Élévation 360,73 (Z)		Date: 2013-08-29										
		Prof. du roc: 4,26 m Prof. de fin: 5,69 m												
État des échantillons Intact Remanié Perdu Carotte			Examens organoleptiques sur les sols: Aspect visuel: Inexistant(I); Disséminé(D); Imbibé(IM) Odeur: Inexistante(I); Légère(L); Moyenne(M); Persistante(P)											
Type d'échantillon CF Carottier fendu TM Tube à paroi mince PS Tube à piston fixe CR Tube carottier TA À la tarière MA À la main TU Tube transparent PW Carottier LVM SG Sol gelé		Abréviations L Limites de consistance W _L Limite de liquidité (%) W _P Limite de plasticité (%) I _p Indice de plasticité (%) I _L Indice de liquidité W Teneur en eau (%) AG Analyse granulométrique S Sédimentométrie R Refus à l'enfoncement VBS Valeur au Bleu du sol PDT Poids des tiges		M.O. Matière organique (%) K Perméabilité (cm/s) PV Poids volumique (kN/m³) A Absorption (l/min. m) U Compression uniaxiale (MPa) RQD Indice de qualité du roc (%) AC Analyse chimique P _L Pression limite, essai pressiométrique (kPa) E _M Module pressiométrique (MPa) E _r Module de réaction du roc (MPa) SP _o Potentiel de ségrégation (mm²/H °C)										
		Niveau d'eau N Pénétration standard (Nb coups/300mm) N _C Pénétration dyn. (Nb coups/300mm) ● σ' _p Pression de préconsolidation (kPa) TAS Taux d'agressivité des sols		Résistance au cisaillement C _U Intact (kPa) C _{UR} Remanié (kPa)										
PROFONDEUR - pi	PROFONDEUR - m	STRATIGRAPHIE			ÉCHANTILLONS					ESSAIS				
		ÉLEVATION - m	DESCRIPTION DES SOLS ET DU ROC	SYMBOLES	NIVEAU D'EAU (m) / DATE	TYPE ET NUMÉRO	SOUS-ÉCH.	ÉTAT	CALIBRE	RÉCUPÉRATION %	Nb coups/150mm	"N" ou RQD	Examens organo.	RÉSULTATS
												Odeur	Visuel	TENEUR EN EAU ET LIMITES (%) W _p W W _L
														RÉSISTANCE AU CISAILLEMENT (kPa) OU PÉNÉTRATION DYNAMIQUE
1	360,73	0,00	Enrobé bitumineux											
2	360,63	0,10	Remblai : sable et gravier avec des traces de silt, brun.		CF-1		N	50				I	I	
3	360,12	0,61	Remblai : constitué d'un mélange de cailloux, de blocs, de sable et de gravier en proportions variables.		CF-2		B	67	40-50 /8cm		R	I	I	
4					CR-3		NX	46						
5					CF-4		B	4	10-8 /11-13		19	I	I	
6					CF-5		B	2	6-5 /5-6		10			
7					CF-6		B	0	4-1 /1-14		2			
8					CR-7		NX	100						
9					CF-8		B	4	1-4 /16-40		20	I	I	
10	356,47	4,26	Socle rocheux : gneiss gris, de bonne qualité.											
11					CR-9		NQ	84			77			
12	355,04	5,69	Fin du forage à une profondeur de 5,69m.											
13														
14														
15														
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25														
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27														
28														
29														
Remarques:														
Type de forage: Tarière et tubage Équipement de forage: UM-2007														
Préparé par: J.-P. Fecteau, tech.					Vérifié par: M.-È. Lemire, ing.					2013-09-16		Page: 1 de 1		

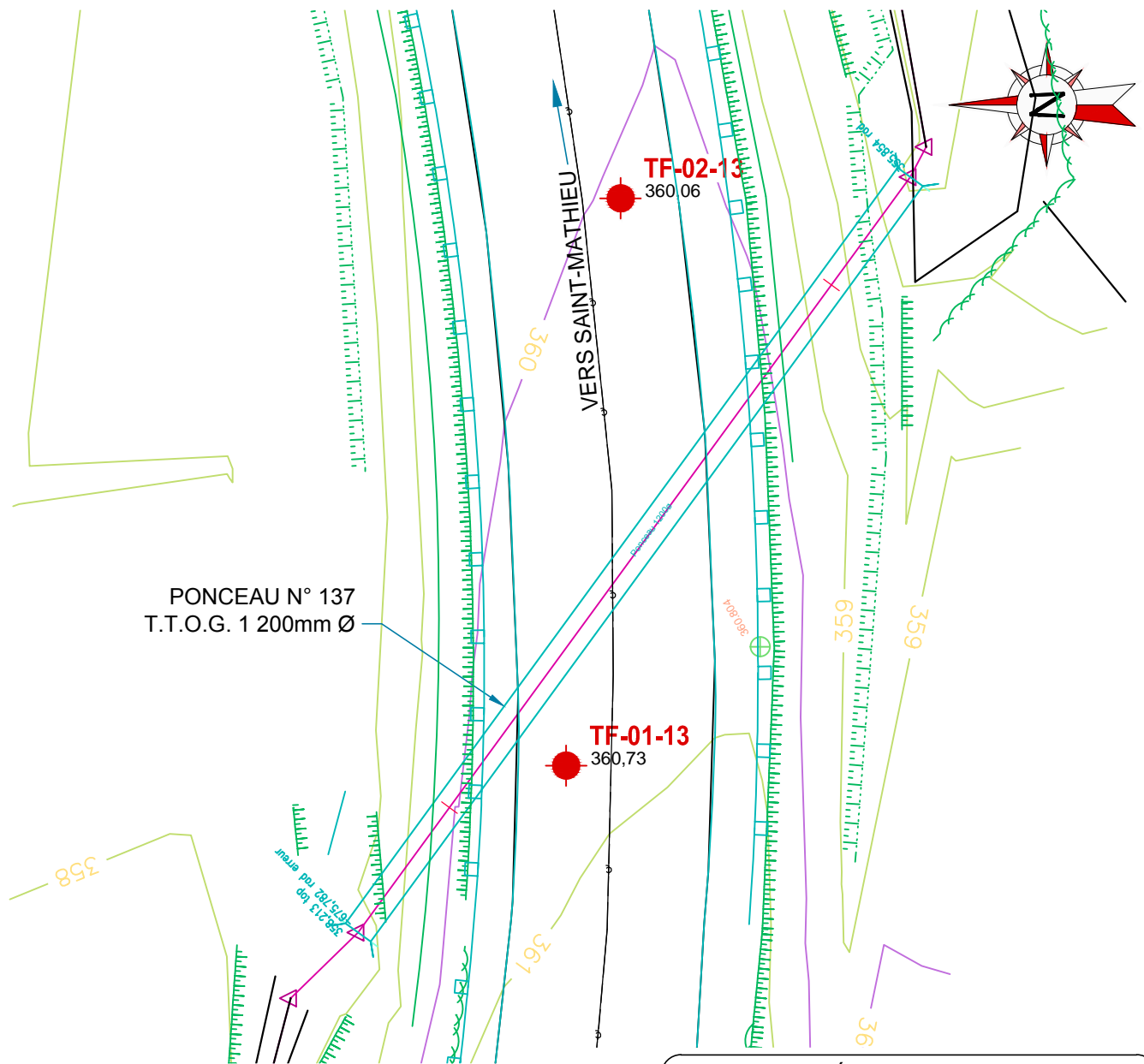
LVM		Client : Dessau inc.		RAPPORT DE FORAGE													
Projet: Remplacement de ponceaux		Coordonnées (m): Nord 5175003,2 (Y)		Dossier n°: P-0004134-0-00-300													
Endroit: Ponceau 137 (chaînage 45+187), Parc National de la Mauricie		UTM Nad83 Est 649561,0 (X)		Sondage n°: TF-02-13													
		Fus.18 Élévation 360,06 (Z)		Date: 2013-08-29													
		Prof. du roc: 5,62 m Prof. de fin: 7,26 m															
État des échantillons  Intact  Remanié  Perdu  Carotte			Examens organoleptiques sur les sols: Aspect visuel: Inexistant(I); Disséminé(D); Imbibé(IM) Odeur: Inexistante(I); Légère(L); Moyenne(M); Persistante(P)														
Type d'échantillon CF Carottier fendu TM Tube à paroi mince PS Tube à piston fixe CR Tube carottier TA À la tarière MA À la main TU Tube transparent PW Carottier LVM SG Sol gelé		Abréviations L Limites de consistance W _L Limite de liquidité (%) W _P Limite de plasticité (%) I _P Indice de plasticité (%) I _L Indice de liquidité W Teneur en eau (%) AG Analyse granulométrique S Sédimentométrie R Refus à l'enfoncement VBS Valeur au Bleu du sol PDT Poids des tiges		M.O. Matière organique (%) K Perméabilité (cm/s) PV Poids volumique (kN/m³) A Absorption (l/min. m) U Compression uniaxiale (MPa) RQD Indice de qualité du roc (%) AC Analyse chimique P _L Pression limite, essai pressiométrique (kPa) E _M Module pressiométrique (MPa) E _r Module de réaction du roc (MPa) SP _o Potentiel de ségrégation (mm²/H °C)													
		Niveau d'eau N Pénétration standard (Nb coups/300mm) N _C Pénétration dyn. (Nb coups/300mm) ● σ' _p Pression de préconsolidation (kPa) TAS Taux d'agressivité des sols		Résistance au cisaillement C _U Intact (kPa) ▲ C _{UR} Remanié (kPa) △ Champier Laboratoire													
PROFONDEUR - pi	PROFONDEUR - m	STRATIGRAPHIE			ÉCHANTILLONS					ESSAIS							
		ÉLÉVATION - m	PROF. - m	DESCRIPTION DES SOLS ET DU ROC	SYMBOLES	NIVEAU D'EAU (m) / DATE	TYPE ET NUMÉRO	SOUS-ÉCH.	ÉTAT	CALIBRE	RÉCUPÉRATION %	Nb coups/150mm	"N" ou RQD	Examens organo.	RÉSULTATS	TENEUR EN EAU ET LIMITES (%) W _p W WL	RÉSISTANCE AU CISAILEMENT (kPa) OU PÉNÉTRATION DYNAMIQUE
		360,06	0,00	Enrobé bitumineux													
1	1	359,98	0,08	Remblai : sable graveleux avec des traces de silt, beige.			CF-1		N	67							
2	2						CF-2		B	58	23-14 24-25	38					
3	3	358,54	1,52	Remblai : sable graveleux et silteux. Présence de matières organiques.			CF-3		B	33	17-12 9-15	21	I	I			
4	4																
5	5	357,32	2,74	Remblai : sable graveleux avec des traces de silt, beige. Présence de matières organiques.			CF-4		B	0	1-3 2-1	5					
6	6	356,55	3,51	Remblai : sable grossier, beige. Présence de matières organiques et de racines.			CF-5		B	58	1-1 1-2	2	I	I			
7	7																
8	8	355,49	4,57	Sol organique, brun foncé, compressible.			CF-6	A	B	21	1-5 4-8	9	I	I			
9	9	355,10	4,96	Sol naturel : sable avec des traces de silt, brun. Présence de fragments de roc en bout de CF.			CF-7	B	B	80	9-50 /10cm	R	I	I			
10	10	354,44	5,62	Socle rocheux : gneiss gris, de qualité moyenne à excellente. Présence de quelques joints oxydés.			CR-8		NQ	96		63					
11	11																
12	12	352,80	7,26	Fin du forage à une profondeur de 7,26m.			CR-9		NQ	100		100					
13	13																
14	14																
15	15																
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25	25																
26	26																
27	27																
28	28																
29	29																
Remarques:																	
Type de forage: Tarière et tubage										Équipement de forage: UM-2007							
Préparé par: J.-P. Fecteau, tech.					Vérifié par: M.-È. Lemire, ing.					2013-09-25		Page: 1 de 1					

Annexe 3 Croquis de localisation des forages



10 cm
5
4
3
2
1
0

\\SHAW-SF1\PROJETS\075\DOSSIERS EXTERNES EN COURS\RP-0004134-0-00-300_PONCEAUX PARC NATIONAL (ANCIEN P-0004071)\2_DOC\PROJCONCEPTZ_CAD\OTP_300\LIVRABLES_GEP\PPP\4134-0-00-300-GE-D-001_0002-00.DWG



PONCEAU N° 137
T.T.O.G. 1 200mm Ø

TF-02-13
360,06

TF-01-13
360,73

LÉGENDE :

TF-NN-AA
00,00 FORAGE-NUMÉRO-ANNÉE
ÉLÉVATION (m)

NOTES :

1. RÉFÉRENCES : LE FOND DE PLAN PROVIENT D'UN EXTRAIT TIRÉ D'UN PLAN ÉMIS PAR DESSAU inc. : 056P0004134300VR_CV3D_PNC137.dwg.

**COORDONNÉES DES SONDAGES-UTM
Nad83 FUSEAU 18**

N° SONDAGE	NORD (Y)	EST (X)	ÉLÉVATION
TF-01-13	5 175 005,3	649 539,1	360,73
TF-02-13	5 175 003,2	649 561,0	360,06

**Ce document doit être utilisé
conjointement avec les recommandations
géotechniques**

CE DOCUMENT D'INGÉNIERIE EST LA PROPRIÉTÉ DE LVM ET EST PROTÉGÉ PAR LA LOI. IL EST DESTINÉ EXCLUSIVEMENT AUX FINS QUI Y SONT MENTIONNÉES. TOUTE REPRODUCTION OU ADAPTATION, PARTIELLE OU TOTALE, EN EST STRICTEMENT PROHIBÉE SANS AVOIR PRÉALABLEMENT OBTENU L'AUTORISATION ÉCRITE DE LVM.

Projet

REEMPLACEMENT DE PONCEAUX

PONCEAU N° 137 (CHAÎNAGE 45+187), PARC NATIONAL DE LA MAURICIE

Titre

LOCALISATION DES FORAGES



LVM inc.

2729, avenue Saint-Marc
Shawinigan (Québec) G9N 2K6
Téléphone : 819.539.8900
Télécopieur : 819.539.1834

Préparé **M.-É. Lemire**
Dessiné **B. Thibaudeau**
Vérifié **M.-É. Lemire**

Discipline **GÉOTECHNIQUE**
Échelle **1 : 250**
Date **2013-09-09**

Chargé de projet
M.-É. Lemire
Extrait de: Rév.:

Serv. resp.	Projet	Otp	Disc.	Type	N° Dessin	Rév.
075	P-0004134	000300	GE	D	0002	00