

# **PUBLIC WORK AND GOVERNMENTAL SERVICES CANADA (PWGSC)**

## **SPECIFICATIONS**



**Projet : Replacing of perimeter fences**

**Date : 2020-02-14**

**AUTHORIZED FOR TENDER**

**Project no TPSGC : R.088111.001**

R.088111.001

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**END OF SECTION**

**Part 1 GENERAL****1.1 WORK COVERED BY CONTRACTUAL DOCUMENTS**

- .1 This specification covers perimeter fences replacement works at the Cowansville institution and the replacement of gates, lighting, intrusion detection systems and many other related works.

**1.2 WORK SEQUENCE**

- .1 Construct Work in stages to accommodate the Departmental Representative's use of premises during construction.
- .2 Co-ordinate Progress Schedule with the occupancy of the premises during construction.
- .3 Follow the phasing plan indicated on the plans.
- .4 Maintain fire access/control.

**1.3 CONTRACTOR USE OF PREMISE**

- .1 The use of the premises is restricted to the areas necessary for the execution of the work, including the areas of stockpiles and storage of equipment.
- .2 Only vehicles, machinery and equipment necessary for the execution of the work will be authorized on the site.
- .3 The Contractor shall adopt a working method to limit traffic as far as possible. Access to the site area should minimize disturbance to the site and the environment.
- .4 Co-ordinate use of premises under direction of Departmental Representative.
- .5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .6 At completion of operations, condition of existing work shall be equal to or better than that which existed before new work started.

**1.4 OCCUPANCY BY THE DEPARTMENTAL REPRESENTATIVE**

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

**1.5 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to building operations and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Use only access routes approved by Departmental Representative for moving workers and material.

**1.6 EXISTING UTILITY SERVICES**

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

- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to vehicular traffic and tenant operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .4 Provide temporary services [when directed by Departmental Representative to maintain critical building systems.
- .5 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .6 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by Departmental Representative.
- .8 Record locations of maintained, re-routed and abandoned service lines.

### **1.7 REQUIRED DOCUMENTS**

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

### **1.8 LANDSCAPING GUARANTEE PERIOD**

- .1 The Contractor must look after the new lawn installed during the work. The maintenance work must start immediately after the receipt of the works with reserve and end 24 months later.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.



**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 APPOINTMENT AND PAYMENT**

- .1 Departmental Representative will appoint and pay for services of testing laboratory except follows:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's convenience.
  - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  - .4 Mill tests and certificates of compliance.
  - .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

**1.3 CONTRACTOR'S RESPONSIBILITIES**

- .1 Provide labour, equipment and facilities to:
  - .1 Provide access to Work for inspection and testing.
  - .2 Facilitate inspections and tests.
  - .3 Make good Work disturbed by inspection and test.
  - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative 48 hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

**Part 1 GENERAL****1.1 ADMINISTRATIVE**

- .1 Departmental Representative is responsible for the following tasks:
  - .1 Schedule and administer project meetings throughout the progress of the work.
  - .2 Prepare agenda for meetings.
  - .3 Distribute written notice of each meeting four (4) days in advance of meeting date to Contractor.
  - .4 Provide physical space and make arrangements for meetings.
  - .5 Preside at meetings.
  - .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
  - .7 Reproduce and distribute copies of minutes within three (3) days after meetings and transmit to meeting participants and, affected parties not in attendance.
- .2 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.2 PRECONSTRUCTION MEETING**

- .1 Departmental Representative is responsible for the following tasks:
  - .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
  - .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
  - .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
  - .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
  - .5 Agenda to include:
    - .1 Appointment of official representative of participants in the Work.
    - .2 Schedule of Work: in accordance with Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart.
    - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
    - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
    - .5 Delivery schedule of specified equipment.
    - .6 Site security.
    - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
    - .8 Record drawings in accordance with Section 01 33 00 - *Submittal Procedures*.

- .9 Maintenance manuals in accordance with Section 01 78 00 - *Closeout Submittals*.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - *Closeout Submittals*.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

### 1.3 PROGRESS MEETINGS

- .1 Departmental Representative is responsible for the following tasks:
  - .1 During course of Work and two (2) weeks prior to project completion, schedule progress meetings every two (2) weeks.
  - .2 Contractor, major Subcontractors involved in Work Departmental Representative are to be in attendance.
  - .3 Notify parties minimum five (5) days prior to meetings.
  - .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three (3) days after meeting.
  - .5 Agenda to include the following:
    - .1 Review, approval of minutes of previous meeting.
    - .2 Review of Work progress since previous meeting.
    - .3 Field observations, problems, conflicts.
    - .4 Problems which impede construction schedule.
    - .5 Review of off-site fabrication delivery schedules.
    - .6 Corrective measures and procedures to regain projected schedule.
    - .7 Revision to construction schedule.
    - .8 Progress schedule, during succeeding work period.
    - .9 Review submittal schedules: expedite as required.
    - .10 Maintenance of quality standards.
    - .11 Review proposed changes for affect on construction schedule and on completion date.
    - .12 Other business.

## Part 2 PRODUCTS

### 2.1 NOT USED

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**FIN DE LA SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 DEFINITIONS**

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five (5) days work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

**1.3 REQUIREMENTS**

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately ten (10) working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

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

#### **1.5 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within five (5) working days.
- .3 Revise impractical schedule and resubmit within five (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 and phasing of Work shown on plan R\_088111\_001-C03-PN-CLO. The Project Schedule can be carried out globally or by side of the fence, according to the Contractor.
- .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 Lighting to build and demolish.
  - .6 Security system to build and demolish with temporary system between the appropriate steps.
  - .7 Construction of external perimeter fence, including barriers.
  - .8 Demolition of existing external perimeter fence.
  - .9 Construction of the internal perimeter fence, including barriers.
  - .10 Demolition of existing internal perimeter fence.
  - .11 Demolition of the existing concrete sidewalk.
  - .12 Construction of the proposed concrete sidewalk, including foundations and insulation.
  - .13 Earthworks and landscaping.
  - .14 Crushed stone foundation and paving.
  - .15 Demobilization.



**1.7 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule once every two (2) weeks reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

**1.8 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .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 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 ADMINISTRATIVE**

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

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Québec, Canada.
- .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 seven (7) days for Departmental Representative's review of each submission.

- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date;
  - .2 Project title and number;
  - .3 Contractor's name and address;
  - .4 Identification and quantity of each shop drawing, product data and sample;
  - .5 Other pertinent data.
- .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.
  - .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 Wiring diagrams;
    - .7 Single line and schematic diagrams;
    - .8 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit one (1) electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

- .12 Submit one (1) electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit one (1) electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit one (1) electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit one (1) electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Submit one (1) electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .20 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean by Departmental Representative approves the contents of shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

**1.4 METHODS**

- .1 Prior to the pre-meeting, the Contractor shall submit, for comments and approval by the Departmental Representative, a document describing in detail all of his work and access procedures for carrying out the work according to its schedule.

**1.5 MOCK-UPS**

- .1 Erect mock-ups in accordance with section 01 45 00 – *Quality Control*.

**1.6 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic and hard copy of colour digital photography in jpg format, standard resolution monthly with progress statement and as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 4 locations
  - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: weekly.

**1.7 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.
- .3 Minutes must be issued less than five (5) business days after a meeting.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

## 1 PURPOSE

- .1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

## 2 DEFINITIONS

- .1 "*Contraband*" means:
  - .1 an intoxicant, including alcoholic beverages, drugs and narcotics;
  - .2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization;
  - .3 an explosive or a bomb or a component thereof;
  - .4 currency over any applicable prescribed limit 25.00\$, and
  - .5 any item not described in paragraphs (a) to (d) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
- .2 "Unauthorized Smoking Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing or snuffing tobacco, cigarette making machines, matches and lighters.
- .3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
- .4 "CSC" means Correctional Service Canada.
- .5 "Director" means Director or Warden of the Institution as applicable or their representative.
- .6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .7 "Departmental Representative" means the Public Works and Government Services Canada (PWGSC) or the Correctional Service Canada (CSC) project manager and the Consultant depending on project.
- .8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.
- .9 "Construction zone" means the area as shown on the contract drawings where the contractor will be allowed to work. This area may or may not be isolated from the security area of the institution. See plan sheet R.088111\_001-C03-PN-CLO

### **3 PRELIMINARY PROCEEDINGS**

- .1 Prior to the commencement of work, the contractor shall meet with the Director to:
  - .1 Discuss the nature and extent of all activities involved in the Project;
  - .2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.
- .2 The contractor will:
  - .1 Ensure that all construction employees are aware of the CSC security requirements;
  - .2 Ensure that a copy of the CSC security requirements is always prominently on display at the job site;
  - .3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

### **4 CONSTRUCTION EMPLOYEES**

- .1 Submit to the Director a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee.
- .2 Allow two (2) weeks for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at the institution where the project is taking place.
- .3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the construction employees clothing at all time while employees are at the institution.
- .4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.
- .5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
  - .1 appear to be under the influence of alcohol, drugs or narcotics;
  - .2 behave in an unusual or disorderly manner;
  - .3 are in possession of contraband.

## 5 VEHICLES

- .1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked, and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.
- .2 The director may limit at any time the number and type of vehicles allowed within the Institution.
- .3 Drivers of delivery vehicles for material required by the project shall not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or Commissionaires while in the Institution.
- .4 If the Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter must be locked when not in use.

## 6 PARKING

- .1 The parking area(s) to be used by construction employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

## 7 SHIPMENTS

- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the institution's own shipments. The contractor must have his own employees on site to receive any deliveries or shipments. CSC staff will **NOT** accept receipt of deliveries or shipments of any material equipment or tools for the contractor.

## 8 TELEPHONES

- .1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the institution unless prior approval of the Director is received.
- .2 The Director will ensure that approved telephones, Facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an Internet connection to unauthorized personnel.
- .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, Blackberries, telephone used as 2-way radios, are not permitted within the perimeter of the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.



- .4 The Director may approve but limit the use of two-way radios. Cell phones, tablets, computers and cameras on internal or external circuit are prohibited.

## **9 WORK HOURS**

- .1 Work hours within the Institution are: Monday to Friday, from 7:30 to 16:00.
- .2 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice must be submitted 24 hours in advance to the Director.

## **10 OVERTIME WORK**

- .1 No overtime work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such the completion of a concrete pour or work to make the construction safe and secure, the contractor shall advise the Director as soon as this condition is known and follow the directions given by the Director. Costs to Canada for such events may be attributed to the contractor.
- .2 When overtime work, weekend statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his designate, to maintain the security surveillance. The actual cost of this extra staff may be attributed to the contractor.

## **11 TOOLS AND EQUIPMENT**

- .1 Maintain on site a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.
- .2 Throughout the construction project maintain an up-to-date list of tools and equipment specified above.
- .3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.
- .4 Store all tools and equipment in approved secure locations.
- .5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor.
- .6 Scaffolding shall be secured and locked when not erected and when erected, shall be secured in a manner agreed upon with the director.
- .7 All missing or lost tools or equipment shall be reported immediately to the Director.
- .8 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:

- .1 At the beginning and conclusion of every construction project;
- .2 Weekly, when the construction project extends longer than a one-week period.
- .9 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.
- .10 If propane or natural gas is used for heating the construction, the institution will require that an employee of the contractor supervise the construction site during non-working hours.

## **12 KEYS**

### **SECURITY HARDWARE KEYS**

- .1 The Contractor shall arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).
- .2 The SMO will provide a receipt to the Contractor for security hardware keys.
- .3 The contractor will provide a copy of the above-mentioned receipt to the Departmental Representative.

### **OTHER KEYS**

- .1 The contractor will use standard construction cylinders for locks for his use during the construction period.
- .2 The contractor will issue instructions to his employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.
- .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
  - .1 Prepare an operational keying schedule;
  - .2 accept the operational keys and cylinders directly from the lock manufacturer;
  - .3 Arrange for removal and return of the construction cores and install the operational core in all locks.
- .4 Upon putting operational security keys into use, the CSC construction escort shall obtain these keys as they are required from the SMO and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the CSC construction escort.

## **13 SECURITY HARDWARE**

- .1 Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.

## **14 PRESCRIPTION DRUGS**

- .1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one-day supply only into the Institution.

## **15 SMOKING RESTRICTIONS**

- .1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.
- .2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.
- .3 Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.

## **16 CONTRABAND**

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.
- .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.
- .3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
- .4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

## **17 SEARCHES**

- .1 All vehicles and persons entering institutional property may be subject to search.
- .2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband or unauthorized items, he may order that person to be searched.
- .3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

**18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL PROPERTY**

- .1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

**19 MOVEMENT OF VEHICLES**

- .1 Escorted commercial vehicles will be allowed to enter or leave the institution through the vehicle access gate during the following hours:
  - .1 07 h 45 to 11 h 00
  - .2 13 h 00 to 15 h 30.

Construction vehicles shall not leave the Institution until an inmate count is completed.

- .2 The contractor shall advise the Director twenty-four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.
- .3 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or Commissionaires working under the authority of the Director.
- .4 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.
- .5 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution.
- .6 Private vehicles of construction employees will not be allowed within the security perimeter of medium or maximum-security institutions without the authorization of the Director.
- .7 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.
- .8 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another fixed object.

**20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY**

- .1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.
- .2 However, notwithstanding paragraph above, the Director may:
  - .1 Prohibit or restrict access to any part of the institution;
  - .2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when escorted by a member of the CSC security staff or a commissionaire.

- .3 During the lunch and coffee/health breaks, all construction employees will remain within the construction site. Construction employees are not permitted to eat in the officer's lounge or the dining room of the institution.

## **21 SURVEILLANCE AND INSPECTION**

- .1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.
- .2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

## **22 STOPPAGE OF WORK**

- .1 The director may order at any time that the contractor, his employees, sub-contractors and their employees to not enter or to leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the CSC staff member giving this instruction, the time of the request and obey the order as quickly as possible.

The contractor shall advise the Departmental Representative of this interruption of the work within 24 hours.

## **23 CONTACT WITH INMATES**

- .1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any construction employee doing any of the above will be removed from the site and his security clearance revoked.
- .2 It is to be noted that cameras are not allowed on CSC property.
- .3 Notwithstanding the above paragraph, if the director approves of the usage of cameras, it is strictly forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

## **24 COMPLETION OF CONSTRUCTION PROJECT**

- .1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – *Submittal procedures*

**1.2 REFERENCES**

- .1 Province of Quebec
  - .1 An Act respecting occupational health and safety, CQLR, c. S-2.1.
  - .2 Safety Code for the construction industry, CQLR, c. S-2.1, r.4.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Submit site-specific Health and Safety Plan: Within (7) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include.
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
- .3 Submit a copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative once every two (2) weeks.
- .4 Submit within 24 hours to Departmental Representative copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit to the Departmental Representative a report of investigation for any accident resulting in injury and for any incident that highlights a potential for risk.
  - .1 The investigation report must contain at least the following elements:
    - .1 Date, time and place of accident.
    - .2 Name of the subcontractor involved in the accident.
    - .3 Number of people involved and condition of the wounded.
    - .4 Identification of witnesses.
    - .5 Detailed description of the tasks performed at the time of the accident.
    - .6 Equipment used to perform the tasks performed at the time of the accident.
    - .7 Corrective action taken immediately after the accident.
    - .8 Causes of the accident.
    - .9 Preventive measures put in place to prevent a similar accident.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven (7) days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within ten (10) days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

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

#### **1.4 PRODUCTION OF THE CONSTRUCTION OPENING NOTICE**

- .1 Before starting the Work, send the CNESST site opening notice. Submit to the Departmental Representative a copy of the site opening notice and acknowledgment of receipt sent by CNESST.
  - .1 At the end of all the Work, the closure notice must be sent to the CNESST, with a copy to the Departmental Representative.
- .2 The Contractor shall assume the role of the Principal Contractor at all times within the boundaries of the work site and elsewhere where he or she is to perform work in this project. The Contractor must recognize the responsibility of the Principal Contractor and thus identify himself in the site opening notice that he transmits to the CNESST.
- .3 The Contractor must agree to divide and identify the site appropriately, in order to define the time and space at any time during the duration of the project.

#### **1.5 SAFETY ASSESSMENT**

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

#### **1.6 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
- .2 A decision-making representative of the Contractor must attend all meetings that discuss health and safety on the site.

#### **1.7 REGULATORY REQUIREMENTS**

- .1 Comply with all laws, regulations and standards that are applicable to the execution of the work.

#### **1.8 GENERAL REQUIREMENTS**

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

#### **1.9 RESPONSIBILITY**

- .1 The Contractor must accept and assume all the duties and obligations normally assigned to the Principal Contractor under the Act respecting occupational health and safety (CQLR, chapter S-2.1) and the Safety Code for the construction industry (S-2.1, r.4).
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

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

#### **1.10 INHERENT RISKS TO THE WORK SITE**

- .1 In addition to the risks related to the tasks to be performed, the personnel in charge of the work on the site will be exposed to the following risks, inherent to the place where the work will be carried out. The Contractor must include these elements in his prevention program, without being limited to:
  - .1 Where the work will take place, there is presence of:
    - .1 Underground services (electricity, gas, steam, water line, ...)
    - .2 Landscaping to conserve and protect.

#### **1.11 SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND THE PUBLIC**

- .1 The site where the work will take place is occupied by employees and/or the public at all times. Although these persons do not have access to the Contractor's site, the Contractor must take into account the following specific requirements for the protection of employees and/or the public:
  - .1 The phasing of the work is essential to maintain the integrity of the security measures of the correctional institution.
  - .2 These requirements must be included in the Contractor's prevention program as well as all other measures provided by the Contractor to protect the health and safety of the employees and / or the public present on the site.

#### **1.12 UNFORSEEN HAZARDS**

- .1 When a source of danger not specified in the contract documents, and not identifiable during the preliminary inspection of the site appears by the fact or during the execution of the work, the Contractor must stop work immediately, notify the person responsible for health and safety on site, put in place temporary protective measures for workers and the public and notify the Departmental Representative verbally and in writing. The Contractor must then make the necessary modifications to the prevention program and put in place the necessary safety measures so that the work can resume.

#### **1.13 PERSON RESPONSIBLE FOR HEALTH AND SAFETY**

- .1 The Contractor must appoint a competent person as supervisor and responsible for health and safety, regardless of the size of the site or the number of workers present. This person must be present at all times on the site and must be able to take all the necessary measures to ensure the health and safety of people and property on the job and in the immediate environment of the worksite that could be affected by the progress of the work. The Contractor must forward the name of this person to the Departmental Representative before work begins.



#### **1.14 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.
- .2 At a minimum, the following information and documents should be posted in an easily accessible place for workers:
  - .1 Site opening notice.
  - .2 Identification of the Principal Contractor.
  - .3 OHS corporate policy.
  - .4 Site specific prevention program.
  - .5 Emergency plan.
  - .6 Minutes of the site committee meetings.
  - .7 Names of representatives on the site committee.
  - .8 Names of the first responders.
  - .9 Intervention and correction reports issued by the CNESST.

#### **1.15 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 The Contractor must give the safety officer or, where there is no safety officer, the person authorized to deal with health and safety, all the authority necessary to order stopping and resuming work when he or she deems it necessary or desirable for health and safety reasons. He or she will have to ensure that the health and safety of the public and site personnel and the protection of the environment always take precedence over issues related to the cost and schedule of work.
- .4 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

#### **1.16 PREVENTION OF VIOLENCE**

- .1 Health and Safety management at Public Works and Government Services Canada sites includes the implementation of measures to protect the psychological health of all who access the site where the work is being conducted. Thus, in addition to physical abuse, verbal abuse, bullying and harassment are not tolerated on the site. Anyone who demonstrates such actions or behaviors will receive a warning and/or may be permanently removed from the job site by the Departmental Representative.

#### **1.17 BLASTING**

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

**1.18 ELECTRICITY WORKS**

- .1 The Contractor shall ensure that all electrical work is performed by qualified employees in accordance with provincial regulations on qualification and vocational training.
- .2 The Contractor must meet the requirements of CSA Z462 Workplace Electrical Safety.
- .3 Any work on electrical equipment must be done without power unless it is not possible to completely disconnect this equipment.
- .4 The Contractor must notify the Departmental Representative in writing for any work that can not be done without power and authorization. He will have to demonstrate to the Departmental Representative that it is impossible to do the work without power and provide all the necessary information to complete and obtain a work permit under tension (work method, evaluation of the level of electric arc, perimeter of protection , protective equipment, etc.) before the start of the work, except for the exceptions provided in CSA Z462 Electrical Safety.
- .5 If, for the operational needs of site occupants, the Departmental Representative requires the Contractor to perform live work, the Contractor must obtain all the information necessary to complete a live work permit (work method, assessment of the level of arc, perimeter of protection, protective equipment, etc.) and have it signed by the site representative designated by the Departmental Representative prior to the commencement of the work.

**1.19 PREVENTING RISK OF FALLS**

- .1 Plan and organize work to promote the elimination at source of fall hazards or collective protection and thus minimize the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness in accordance with CAN - CSA - Z - 259.10 - M90. The security belt must not be used as a fall protection.

**1.20 EXCAVATION WORK**

- .1 In addition to the requirements of the Safety Code for the Construction Industry, the Contractor who performs trenching or excavation work must meet the following requirements:
  - .1 Complete the form below and send it to the Departmental Representative before digging begins.
  - .2 Submit to the Departmental Representative, as applicable, the following documents:
    - .1 Plans and specifications, signed and sealed by an engineer, shoring to put in place for digging work; or
    - .2 Engineer's opinion specifying the angle of the walls of the trench or the excavation.



- .1 In addition to the requirements set out in the preceding paragraphs, the Contractor must comply with the following requirements:
  - .1 Welding and cutting must be done in accordance with the requirements of the Safety Code for the Construction Industry, S-2.1, r.4 and CSA W117.2 Safety Rules for Welding, Cutting and Allied Processes.
  - .2 Interrupt any activity that produces flammable or combustible gases, vapors or dusts near welding or cutting operations.
  - .3 Store all oxygen cylinders at a distance of at least 6 m from flammable gas cylinders (e.g.: acetylene) or a combustible material such as oil or grease, unless separated by a partition made of non-combustible material as specified in section 3.13.4 of the Safety Code for the construction industry, S-2.1, r.4.
  - .4 Store bottles away from all sources of heat.
  - .5 Place welding equipment on flat ground protected from the elements.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCE STANDARDS**

- .1 Definitions
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
  - .3 Soils that meet applicable CCME guidelines: refers to soils with contaminant concentrations that are less than or equal to Canadian environmental quality guidelines.
  - .4 Recommendations for Soil Quality: Environment and Human Health, for Residential / Park Use by the Canadian Council of Ministers of the Environment. See SNC-Lavalin GEM Québec Inc.'s geotechnical study and soil characterization for soil quality results in place.
- .2 Standards
  - .1 Canadian Construction Documents Committee (CCDC)
    - .1 CCDC 2-2008 Stipulated Price Contract.
  - .2 U.S. Environmental Protection Agency (EPA)/Office of Water
    - .1 EPA 832-R-92-005, Storm Water Management for Construction Activities, Chapter 3.
  - .3 Bureau de normalisation du Québec (BNQ)
    - .1 BNQ 2410-300 (2009-10-01) – *Products used as dust control agents for non-asphalted roads and other similar surfaces.*
  - .4 Department of Justice
    - .1 Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33)
  - .5 Province of Quebec.
    - .1 Environment quality act (RSQ, c. Q-2)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Include in Environmental Protection Plan:

- .1 Names of people responsible for ensuring adherence to Environmental Protection Plan.
- .2 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .3 Drawings indicating locations of proposed material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .4 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
- .5 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .6 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

#### **1.4 FIRES**

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

#### **1.5 DRAINAGE**

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .3 Provide for the disposal of water containing suspended solids or harmful substances in accordance with CEPA requirements. Before any discharge to a storm sewer, the water must be pumped, decanted and analyzed. The results of the analysis must comply with the applicable standards and regulations in order to authorize the rejection.
- .4 In the event that there is a floating phase of hydrocarbons on the surface of the water, means such as absorbents or skimming must be used to recover it. Dispose absorbents and the recovered floating phase according to the regulations.
- .5 The site must be protected from standing water and running water. Arrange the site accordingly to protect it from soil erosion.
- .6 Constantly monitor surface drainage to identify any problems as soon as they appear.
- .7 The Contractor shall have at its disposal pumping equipment of sufficient capacity, as well as tanks and all related machinery in good working order, to deal with all ordinary emergencies, including power outages and breakage. The Contractor must have at his disposal workers who are competent to operate the pumping equipment.

#### **1.6 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Minimize stripping of topsoil and vegetation.

**1.7 POLLUTION CONTROL**

- .1 Control emissions from equipment and plant in accordance with CEPA.
- .2 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

**1.8 EQUIPMENT, VEHICLES AND MACHINERY**

- .1 A prior and then regular inspection of the machinery and equipment used will be carried out to ensure that they are in good condition, clean and free from any leakage of oil or other contaminants. Depending on the equipment and its use, the inspection should be done daily or weekly. Their exhaust and emission systems will also be inspected and repaired as needed.
- .2 Vehicles or equipment that leaks must be repaired immediately or removed from the site.
- .3 Refueling, lubrication of equipment, storage of petroleum products and hazardous materials and all other repair and maintenance of machinery and equipment will be carried out in designated areas.
- .4 Place machinery on impermeable mats or cloths before refueling or use a containment device to contain any eventual spills.

**1.9 AIR QUALITY PROTECTION**

- .1 Water will be preferred to another type of dust suppressant for controlling suspended particulate emissions, particularly for surfaces with a coating. In the case of the use of another dust suppressor, it must comply with the BNQ 2410-300 standard.
- .2 Dump trucks carrying granular materials, which may contain fine particles, shall be provided with waterproof tarpaulins.
- .3 The Contractor shall: avoid idling of any vehicle, equipment or machinery when they are not in use; to repair without delay equipment and machinery that produces excessive emissions of gas, visible in the exhaust; and to maintain in good condition the equipment anti-pollution system.

**1.10 SPILL MANAGEMENT AND PREVENTION**

- .1 Good practices must be adopted to avoid spilling oil from machinery or equipment.
- .2 Petroleum products must be stored, handled and used with care on a stable, impermeable and inaccessible surface after construction hours.
- .3 In the event of an environmental incident, the Contractor must promptly notify the Departmental Representative and comply with the following rules:
  - .1 Control any leak.
  - .2 Confine the spilled product to restrict its extent.
  - .3 Recover the contaminated material and send it to a site authorized by the MELCC. Evidence of disposition should be forwarded to the Departmental Representative.
  - .4 Characterize soils, backfill materials, etc., affected by an accidental spill and dispose of them in accordance with the regulations in force.

- .5 Within 24 hours of the incident, submit a written report of the event to the Departmental Representative (including the description and location of the accident, the spilled product, and the quantity, date and time of the occurrence, and the name and telephone number of the person who found the accident).
- .6 In the event of a spill of oil or hazardous materials into the environment, the signage for the event will be made to Departmental Representative, Environment Canada's Environmental Emergency Service (1-866-283-2333), Emergency Environment Québec (1 866 694-5454) and any other authority in charge of environmental emergencies. The recovery as well as the disposal of contaminants and contaminated elements will be carried out in accordance with the regulations in force.
- .7 The Contractor is responsible for paying all costs related to the decontamination and disposal of contaminated soil following an accidental spill or leak of a contaminant arising directly or indirectly from its activities. The Contractor must dispose of these contaminated materials to a site authorized by the MELCC.
- .8 The Contractor must have on the site at all times emergency kits for the recovery of petroleum products. The kits must have sufficient absorbent rollers to prevent runoff into the storm water system and/or to allow the containment of petroleum products within the perimeter of the machinery. They must be available near the machinery and be easily accessible at all times for a quick response. In addition, the personnel required to contain, without delay, any accidental release of contaminants must be ready and available.
- .9 The development and implementation of contingency plans for accidental spills of contaminants will be included in the Environmental Protection Plan. Workers will have access to a sheet listing the names and phone numbers of managers and describing alert structures.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 EXECUTION**

### **3.1 CLEANING**

- .1 Excavation materials meeting CCME recommendations may be reused as backfill material in the original excavation.

**END OF SECTION**



**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCE STANDARDS**

- .1 Canadian Construction Documents Committee (CCDC)
  - .1 CCDC 2 -2008, Stipulated Price Contract.

**1.3 INSPECTION**

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

**1.4 INDEPENDENT INSPECTION AGENCIES**

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

**1.5 ACCESS TO WORK**

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

**1.6 PROCEDURE**

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

**1.7 REJECTED WORK**

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

**1.8 REPORTS**

- .1 Submit four (4) copies of inspection and test reports to Departmental Representative.

**1.9 TESTS AND MIX DESIGNS**

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

**1.10 MILL TESTS**

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

**1.11 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical and electrical systems.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCE STANDARDS**

- .1 Canadian General Standards Board (CGSB).
  - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 CSA Group (CSA).
  - .1 CAN/CSA-A23.1-14 /A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.
  - .2 CAN/CSA-O121-17, Douglas Fir Plywood.
  - .3 CAN/CSA-S269.2-16, Access Scaffolding for Construction Purposes.
  - .4 CAN/CSA-Z321-96 (R2006), Signs and Symbols for the Workplace.
- .3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.
- .4 U.S. Environmental Protection Agency (EPA) / Office of Water.
  - .1 EPA 832-R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4 INSTALLATION AND REMOVAL**

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

**1.5 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide scaffolding, access ramps, ladders, swing staging, platforms and temporary stairways necessary for the performance of the work and maintain them.

**1.6 HOISTING**

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

**1.7 SITE STORAGE/LOADING**

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

**1.8 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site where shown on plans.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

**1.9 OFFICES**

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

**1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE**

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

**1.11 SANITARY FACILITIES**

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

**1.12 CONSTRUCTION SIGNAGE**

- .1 Provide project identification site sign comprising framing, and one 1200 x 2400 mm signboard as detailed and as described below.
  - .1 Foundations: 15 MPa concrete to CSA-A23.1 minimum 200 mm x 900 mm deep.
  - .2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
  - .3 Signboard: Medium Density Overlaid Douglas Fir Plywood to CSA O121.
  - .4 Paint: alkyd enamel to CAN/CGSB-1.59.
  - .5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
  - .6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by Departmental Representative.
- .2 Direct requests for approval to erect Consultant/Contractor signboard to Departmental Representative. For consideration general appearance of Consultant/Contractor signboard must conform to project identification site sign. Wording in both official languages.
- .3 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .4 Maintain approved signs and notices in good condition for duration of project and dispose of off site on completion of project or earlier if directed by Departmental Representative.

**1.13 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Remove, upon completion of work, haul roads designated by Departmental Representative.

**1.14 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- .2 Inspect, maintain and repair control equipment as needed until permanent vegetation is established.
- .3 Remove control resources at the appropriate time and restore and stabilize surfaces disturbed during this work.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCE STANDARDS**

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents.

**1.3 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.4 AVAILABILITY**

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

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

### **1.5 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

### **1.6 TRANSPORTATION**

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

### **1.7 MANUFACTURER'S INSTRUCTIONS**

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

### **1.8 QUALITY OF WORK**

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



- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

### **1.9 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

### **1.10 REMEDIAL WORK**

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

### **1.11 LOCATION OF FIXTURES**

- .1 Inform Departmental Representative of conflicting installation. Install as directed.

### **1.12 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

### **1.13 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

### **1.14 PROTECTION OF WORK IN PROGRESS**

- .1 Prevent overloading of Works.

### **1.15 EXISTING UTILITIES**

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

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

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Submit written request in advance of demolition Work which affects:
  - .1 Structural integrity of elements of project.
- .3 Include in request:
  - .1 Identification of project;
  - .2 Location and description of affected Work;
  - .3 Description of proposed Work, and products to be used;
  - .4 Date and time work will be executed.

**1.3 MATERIALS**

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

**1.4 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

**1.5 EXECUTION**

- .1 Execute demolition work including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .6 Restore work with new products in accordance with requirements of Contract Documents.

.7 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.8 Refinish surfaces to match adjacent finishes.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCE STANDARDS**

- .1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

**1.3 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building and remove from site.
- .4 Make arrangements with and obtain municipal and provincial permits for disposal of waste and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - *Waste Management and Disposal*.
- .6 Dispose of waste materials and debris off site.

**1.4 CLEANING**

- .1 Maintain cleanliness of site and contiguous areas in accordance with local, provincial and federal laws, ordinances, codes and bylaws related to fire safety and protection.
- .2 Coordinate cleaning activities with disposal operations to prevent the accumulation of dust, dirt, debris, waste materials and waste.

**1.5 FINAL DECONTAMINATION**

- .1 Perform final decontamination of facilities, equipment, materials and equipment that may have come into contact with potentially contaminated materials and equipment before they are removed from the site.
- .2 Perform decontamination as required to the satisfaction of Departmental Representative. If necessary, the Departmental Representative may request the Contractor to perform additional decontamination work.

**1.6 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.

- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .5 Make arrangements with and obtain municipal and provincial permits for disposal of waste and debris.
- .6 Remove stains, spots, marks and dirt from existing Work.
- .7 Clean lighting reflectors, lenses, and other lighting surfaces.
- .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .9 Remove dirt and other disfiguration from exterior surfaces.
- .10 Sweep and wash clean paved areas.
- .11 Repair all damage caused to the work site, public or private property affected by storage of equipment, storage of materials and works on the environment.
- .12 Once the Work has been completed, return the lands affected by the work to a condition greater than or equal to that where they were before the start of the Work.

**1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor's commitment to reduce and divert waste materials from landfill and includes the following:
  - .1 Preparation of a Draft Construction Waste Management Plan that will be used to track the success of the Construction Waste Management Plan against actual waste diversion from landfill.
  - .2 Preparation of a Construction Waste Management Plan that provides guidance on a logical progression of tasks and procedures to be followed in a pollution prevention program to reduce or eliminate the generation of waste, the loss of natural resources, and process emissions through source reduction, reuse, recycling, and reclamation.
  - .3 Preparation of monthly progress reports indicating cumulative totals representing progress towards achieving diversion and reduction goals of waste materials away from landfill and identifying any special programs, landfill options or alternatives to landfill used during construction.
  - .4 Preparation of a Construction Waste Management Report containing detailed information indicating total waste produced by the project, types of waste material and quantity of each material, and total waste diverted, and diversion rates indicated as a percentage of the total waste produced.
- .2 This project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials (ASTM):
  - .1 ASTM E 1609-01, Standard Guide for Development and Implementation of a Pollution Prevention Program.

**1.3 DEFINITIONS**

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re modeling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.

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

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

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



## **1.5 SUBMITTALS**

- .1 Provide required information in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of Contractor's Construction Waste Management Plan.
  - .2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this project prior to any waste removal from site and that includes the following information:
    - .1 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.
    - .2 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials and incorporate into CWM Plan.
    - .3 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled or composted during the course of the project, and the proposed local market for each material.
    - .4 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials where facilities exist.
    - .5 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.
    - .6 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
    - .7 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

## **1.6 PROJECT CLOSEOUT SUBMISSIONS**

- .1 Diversion Documentation: Submit as constructed information in accordance with Section 01 78 00 - *Closeout Submittals* as follows:
  - .1 Construction Waste Management Report (CWM Report): Submit a CWM Report for this project that includes the following information:
    - .1 Accounting: Submit information indicating total waste produced by the project.
    - .2 Composition: Submit information indicating types of waste material and quantity of each material.
    - .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
    - .4 Transportation Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.
    - .5 Alternative Daily Cover (ADC): Submit quantities of material that were used as ADC at landfill sites, and that form a part of the total waste generated by the project.
    - .6 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.
    - .7 Photographs: Submit photographs of waste diversion facilities documenting location and signage describing usage of waste separation containers.

## **1.7 QUALITY ASSURANCE**

- .1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan.
  - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials and incorporate into CWM Plan.
  - .2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.
- .2 Certifications: Provide proof of the following during the course of the Work:
  - .1 Compliance Certification: Provide proof that recycling center is third party verified and is listed as a Certified Facility through the registration and certification requirements of the Recycling Certification Institute.

## **1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.

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- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
  - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
  - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 EXECUTION**

### **3.1 CWM PLAN IMPLEMENTATION**

- .1 Manager: Contractor is responsible for designating an on-site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.
- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Departmental Representatives and other site personnel as required to maintain CWM Plan.
- .3 Instruction: Provide on site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project to Subcontractor's at appropriate stages of the project.
- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:
  - .1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
  - .2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.
- .5 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:
  - .1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between Contractor and Departmental Representatives.
  - .2 Monthly waste summary shall contain the following information:
    - .1 The amount in tonnes or m<sup>3</sup> and location of material landfilled,
    - .2 The amount in tonnes or m<sup>3</sup> and location of materials diverted from landfill, and
    - .3 Indication of progress based on total waste generated by the project with materials diverted from landfill as a percentage.

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**3.2 SUBCONTRACTOR'S RESPONSIBILITY**

- .1 Subcontractor's shall cooperate fully with the Contractor to implement the CWM Plan.
- .2 Failure to cooperate may result in penalties being assessed by the Contractor to the responsible Subcontractor's.

**3.3 SAMPLE CONSTRUCTION WASTE MANAGEMENT FORMS**

- .1 Sample waste tracking form below can be used by the Contractor to establish their own forms for recording management of construction waste:

SAMPLE (WASTE MANAGEMENT FORM)

Material stream	Diverted waste by report date				Total	Units
	September	October	November	December		
Material streams	Plastic					m <sup>3</sup>
	Steel					m <sup>3</sup>
	Concrete					m <sup>3</sup>
	Paper/cardboard					m <sup>3</sup>
	Wood					m <sup>3</sup>
	Total diverted waste					m <sup>3</sup>

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures.
  - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2 Request Departmental Representative inspection.
  - .2 Departmental Representative Inspection.
    - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
    - .2 Contractor to correct Work as directed.
  - .3 Completion Tasks: submit written certificates in English and French that tasks have been performed as follows.
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Equipment and systems: tested and adjusted and fully operational.
    - .4 Operation of systems: demonstrated to Owner's personnel.
    - .5 Commissioning of mechanical systems: completed in accordance with 01 91 13 – *General commissioning requirements* and copies of final Commissioning Report submitted to Departmental Representative.
    - .6 Work: complete and ready for final inspection.
  - .4 Final Inspection:
    - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
    - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

**1.3 FINAL CLEANING**

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

**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 ADMINISTRATIVE REQUIREMENTS**

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

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 FORMAT**

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

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

#### 1.4 CONTENTS - PROJECT RECORD DOCUMENTS

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

#### 1.5 AS -BUILT DOCUMENTS AND SAMPLES

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



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

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

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including.
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications and field test records required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

## **1.7 FINAL SURVEY**

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

## **1.8 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences:
  - .1 Include regulation, control, stopping, shut-down, and emergency instructions;
  - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - *Quality Control* and 01 91 13 - *General commissioning requirements*.
- .15 Additional requirements: as specified in individual specification sections.

## **1.9 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

## **1.10 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.

- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed by Departmental Representative; place and store.
- .4 Receive and catalogue items.
  - .1 Submit inventory listing to Departmental Representative.
  - .2 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed by Departmental Representative; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to location as directed by Departmental Representative; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

### **1.11 DELIVERY, STORAGE AND HANDLING**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

### **1.12 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows.
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4-month and 9-month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows.
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include motors of motorized barriers, and commissioned systems such as detection systems and video surveillance.
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Contractor's plans for attendance at 4 and 9-month post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

### **1.13 WARRANTY TAGS**

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water-resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag.
  - .1 Type of product/material.
  - .2 Model number.
  - .3 Serial number.
  - .4 Contract number.
  - .5 Warranty period.
  - .6 Inspector's signature.
  - .7 Construction Contractor.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
  - .1 AFD - Alternate Forms of Delivery, service provider.
  - .2 BMM - Building Management Manual.
  - .3 Cx - Commissioning.
  - .4 EMCS - Energy Monitoring and Control Systems.
  - .5 O&M - Operation and Maintenance.
  - .6 PI - Product Information.
  - .7 PV - Performance Verification.
  - .8 TAB - Testing, Adjusting and Balancing.

**1.2 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
  - .2 Ensure appropriate documentation is compiled into the BMM.
  - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
  - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.
- .4 AFD managed projects the term Departmental Representative in Cx specifications to be interpreted as AFD Service Provider.

### **1.3 COMMISSIONING OVERVIEW**

- .1 For Cx responsibilities refer to Section 01 91 13.13 - *Commissioning Plan*.
- .2 Cx to be a line item of Contractor's cost breakdown.
- .3 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .4 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built Work is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.
- .5 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

### **1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

### **1.5 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review Contract Documents, confirm by writing to Departmental Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation shelf-ready.
  - .5 Understand completely design criteria and intent and special features.

- .6 Submit complete start-up documentation to Departmental Representative.
- .7 Have Cx schedules up-to-date.
- .8 Ensure systems have been cleaned thoroughly.
- .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
- .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

### **1.6 CONFLICTS**

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

### **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 4 weeks after award of Contract:
    - .1 Name of Contractor's Cx agent.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.
  - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
  - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

### **1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 13.16 - *Commissioning Forms*: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

### **1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 91 13.13 – *Commissioning plan*.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:



- .1 Approval of Cx reports.
- .2 Verification of reported results.
- .3 Repairs, retesting, re-commissioning, re-verification.
- .4 Training.

#### **1.10 COMMISSIONING MEETINGS**

- .1 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .2 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .3 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .4 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .5 Ensure subcontractors and relevant manufacturer representatives are present to first meetings and as required on subsequent Cx meetings.

#### **1.11 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

#### **1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days notice prior to commencement.
- .2 Departmental Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

#### **1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Factory testing: manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by Departmental Representative.
  - .3 Arrange for Departmental Representative to witness tests.
  - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

- .3 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### **1.14 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures.
  - .3 Operational testing: document equipment performance.
  - .4 System PV: include repetition of tests after correcting deficiencies.
  - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
  - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
    - .1 Rejected equipment to be remove from site and replace with new.
    - .2 Subject new equipment/systems to specified start-up procedures.

**1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,
  - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

**1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

**1.17 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

**1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

**1.19 INSTRUMENTS / EQUIPMENT**

- .1 Submit to Departmental Representative for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
  - .1 2-way radios.
  - .2 Ladders.
  - .3 Equipment as required to complete work.

## **1.20 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under actual or accepted simulated operating conditions, over entire operating range, in all modes.
  - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

## **1.21 WITNESSING COMMISSIONING**

- .1 Departmental Representative to witness activities and verify results.

## **1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

## **1.23 COMMISSIONING CONSTRAINTS**

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

## **1.24 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

## **1.25 EXTENT OF VERIFICATION**

- .1 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .2 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .3 Perform additional commissioning until results are acceptable to Departmental Representative.

**1.26 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Departmental Representative's approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Departmental Representative deems Contractor's request for second verification was premature.

**1.27 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

**1.28 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

**1.29 COMPLETION OF COMMISSIONING**

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

**1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

**1.31 TRAINING**

- .1 Demonstrate Owner's personnel start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.

**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

**1.33 OCCUPANCY**

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

**1.34 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.35 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

**1.36 OWNER'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL****1.1 SUMMARY**

- .1 Section Includes:
  - .1 Description of overall structure of Plan and roles and responsibilities of commissioning team.
- .2 Related Requirements
  - .1 Section 08 42 29 – *Automatic entrances*
  - .2 Section 26 05 00 – *Common work results for electrical*
  - .3 Section 27 05 13 – *Communication services*
  - .4 Section 27 51 16 – *Public address and mass notification systems*
  - .5 Section 28 23 00 – *Video surveillance*
  - .6 Section 28 31 00 – *Intrusion detection*

**1.2 REFERENCE STANDARDS**

- .1 Underwriters' Laboratories of Canada (ULC)
- .2 CSA Group
  - .1 CSA Z320-11 (R2016), Building commissioning.

**1.3 GENERAL**

- .1 Provide a fully functional installation:
  - .1 Systems, equipment and components meet user's functional requirements before date of acceptance and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
  - .2 Facility user and O&M personnel have been fully trained in aspects of installed systems.
  - .3 Optimized life cycle costs.
  - .4 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
  - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx;
  - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures;
  - .3 Sets out deliverables relating to O&M, process and administration of Cx;
  - .4 Describes process of verification of how built works meet design requirements;
  - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy;

- .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
  - .1 Overview of Cx;
  - .2 General description of elements that make up Cx Plan;
  - .3 Process and methodology for successful Cx.
- .4 Acronyms:
  - .1 Cx - Commissioning.
  - .2 BMM - Building Management Manual.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 WHMIS Safety Data Sheets (SDS).
  - .5 PI - Product Information.
  - .6 PV - Performance Verification.
  - .7 TAB - Testing, Adjusting and Balancing.
  - .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
  - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
  - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

#### **1.4 DEVELOPMENT OF 100% CX PLAN**

- .1 Cx Plan is added into Project Specifications by Departmental Representative.

#### **1.5 REFINEMENT OF CX PLAN**

- .1 During construction phase, Contractor must revise, refine and update Cx Plan to include:
  - .1 Changes resulting from Client program modifications;
  - .2 Approved design and construction changes.
- .2 Contractor must revise, refine and update every 3 months during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

#### **1.6 COMPOSITION, RÔLES ET RESPONSABILITÉS DE L'ÉQUIPE MS**

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members.
  - .1 **PWGSC Design Quality Review Team:** during construction, will conduct periodic site reviews to observe general progress.
  - .2 **PWGSC Quality Assurance Commissioning Manager:** ensures Cx activities are carried out to ensure delivery of a fully operational project including:



- .1 Review of Cx documentation from operational perspective;
- .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation;
- .3 Protection of health, safety and comfort of occupants and O&M personnel;
- .4 Monitoring of Cx activities, training, development of Cx documentation;
- .5 Work closely with members of Cx Team.
- .3 **Departmental Representative** is responsible for:
  - .1 Organizing Cx;
  - .2 Monitoring operations Cx activities;
  - .3 Witnessing, certifying accuracy of reported results;
  - .4 Witnessing and certifying TAB and other tests;
  - .5 Developing BMM;
  - .6 Ensuring implementation of final Cx Plan;
  - .7 Performing verification of performance of installed systems and equipment;
  - .8 Implementation of Training Plan.
- .4 **Construction Team:** contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:
  - .1 Testing;
  - .2 TAB;
  - .3 Performance of Cx activities;
  - .4 Delivery of training and Cx documentation;
  - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
- .5 **Contractor's Cx agent:** implements specified Cx activities including:
  - .1 Demonstrations.
  - .2 Training.
  - .3 Testing.
  - .4 Preparation, submission of test reports.
- .6 **Property Manager:** represents lead role in Operation Phase and onwards and is responsible for:
  - .1 Receiving facility.
  - .2 Day-To-Day operation and maintenance of facility.

## 1.7 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
  - .1 Installation contractor/subcontractor.

- .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
- .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
- .2 Ensure that Cx participant:
  - .1 Could complete work within scheduled time frame.
  - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel.
- .3 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

### **1.8 RISK ASSESSMENT**

- .1 For Work on fences, lighting and the installation of intrusion detection systems at the perimeter of a correctional facility, a poor performance or a deficient installation could allow inmates access to prohibited areas or escape and therefore pose important risks to the safety of the employees of the establishment and the public. Therefore, verify the installation and performance of all systems and equipment installed as part of the project prior to user acceptance.

### **1.9 EXTENT OF CX**

- .1 Cx Structural and Architectural Systems.
  - .1 Motorized barriers.
- .2 Commission electrical systems and equipment.
  - .1 Lighting systems.
    - .1 Lighting equipment.
    - .2 Distribution systems.
  - .2 Other systems and equipment.
    - .1 Optical fiber, speakers, CCTV and intrusion detectors.

### **1.10 DELIVERABLES RELATING TO O&M PERSPECTIVES**

- .1 Provide deliverables:
  - .1 Warranties.
  - .2 Inventory of spare parts, special tools and maintenance materials.
  - .3 Maintenance Management System (MMS) identification system used.
  - .4 WHMIS information.
  - .5 WHMIS Safety Data Sheets (SDS).
  - .6 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

**1.11 DELIVERABLES RELATING TO THE CX PROCESS**

- .1 Provide deliverables:
  - .1 Startup, pre-Cx activities and documentation for systems, and equipment.
  - .2 Completed installation checklists (ICL).
  - .3 Completed product information (PI) report forms.
  - .4 Completed performance verification (PV) report forms.
  - .5 Results of Performance Verification Tests and Inspections.
  - .6 Description of Cx activities and documentation.
  - .7 Training Plans.
  - .8 Cx Reports.
  - .9 Prescribed activities during warranty period.
- .2 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.

**1.12 ACTIVITÉS PRÉALABLES À LA MISE EN SERVICE ET DOCUMENTS CONNEXES**

- .1 Items listed in this Cx Plan include the following:
  - .1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
  - .2 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
  - .3 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ARCHITECTURAL AND STRUCTURAL:
  - .1 Motorized barriers:
    - .1 Ensure that temporary access is established and that the premises remain accessible for the duration of the tests and start-up.
- .3 Pre-Cx activities - ELECTRICAL
  - .1 Lighting systems:
    - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
  - .2 Other systems and equipment:
    - .1 Coordinate activities with facility staff for security systems.

**1.13 START-UP**

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems.
  - .1 Motorized barriers;
  - .2 Lighting equipment and materials, distribution circuits;
  - .3 Optical fiber, speakers, CCTV and intrusion detectors
- .3 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Performance Verification (PV) :
  - .1 Approved Cx Agent to perform.
    - .1 Repeat when necessary until results are acceptable to Departmental Representative.
  - .2 Use procedures modified generic procedures to suit project requirements.
  - .3 Departmental Representative to witness and certify reported results using approved PI and PV forms.
  - .4 Departmental Representative reserves right to verify up to 50% of reported results at random.
  - .5 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

**1.14 INSTALLATION CHECK LISTS (ICL)**

- .1 Refer to Section 01 91 13.16 - *Commissioning Forms*.

**1.15 PRODUCT INFORMATION (PI) REPORT FORMS**

- .1 Refer to Section 01 91 13.16 - *Commissioning Forms*.

**1.16 PERFORMANCE VERIFICATION (PV) REPORT**

- .1 Refer to Section 01 91 13.16 - *Commissioning Forms*.

**1.17 CX SCHEDULES**

- .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
  - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
    - .1 Design criteria, design intents.
    - .2 Pre-TAB review: 28 days after contract award, and before construction starts.
    - .3 Cx agents' credentials: 60 days before start of Cx.
    - .4 Cx procedures: 3 months after award of contract.
    - .5 Cx Report format: 3 months after contract award.

- .6 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
- .7 Notification of intention to start TAB: 21 days before start of TAB.
- .8 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
- .9 Notification of intention to start Cx: 14 days before start of Cx.
- .10 Identification of deferred Cx.
- .11 Implementation of training plans.
- .12 Cx reports: immediately upon successful completion of Cx.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
- .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Contractor, Contractor's Cx agent, Departmental Representative and PWGSC Quality Assurance Commissioning Manager will monitor progress of Cx against this schedule.

### **1.18 CX REPORTS**

- .1 Submit reports of tests, witnessed and certified to Departmental Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

### **1.19 FINAL SETTINGS**

- .1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 08 42 29 – *Automatic entrances*
- .2 Section 26 05 00 – *Common work results for electrical*
- .3 Section 27 05 13 – *Communication services*
- .4 Section 27 51 16 – *Public address and mass notification systems*
- .5 Section 28 23 00 – *Video surveillance*
- .6 Section 28 31 00 – *Intrusion detection*

**1.2 INSTALLATION/ START-UP CHECK LISTS**

- .1 Include the following data:
  - .1 Product manufacturer's installation instructions and recommended checks.
  - .2 Special procedures as specified in relevant technical sections.
  - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

**1.3 PRODUCT INFORMATION (PI) REPORT FORMS**

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's.

**1.4 PERFORMANCE VERIFICATION (PV) FORMS**

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

### **1.5 EXAMPLES OF COMMISSIONING FORMS**

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.

### **1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

- .1 When additional forms are required but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
  - .1 Additional commissioning forms to be in same format as provided by Departmental Representative.

### **1.7 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
  - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
  - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
  - .3 Confirm operation as per design criteria and intent.
  - .4 Identify variances between design and operation and reasons for variances.
  - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
  - .6 Record analytical and substantiating data.
  - .7 Verify reported results.
  - .8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.
  - .9 Submit immediately after tests are performed.
  - .10 Reported results in true measured SI unit values.
  - .11 Provide Departmental Representative with originals of completed forms.
  - .12 Maintain copy on site during start-up, testing and commissioning period.
  - .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 92 00 – *Facility operation*.

**1.8 LANGUAGE**

- .1 Forms in English and French language.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**



**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Related Requirements
  - .1 Section 08 42 29 – *Automatic entrances*
  - .2 Section 26 05 00 – *Common work results for electrical*
  - .3 Section 27 05 13 – *Communication services*
  - .4 Section 27 51 16 – *Public address and mass notification systems*
  - .5 Section 28 23 00 – *Video surveillance*
  - .6 Section 28 31 00 – *Intrusion detection*
- .2 Acronyms
  - .1 BMM - Building Management Manual.
  - .2 Cx - Commissioning.
  - .3 HVAC - Heating, Ventilation and Air Conditioning.
  - .4 PI - Product Information.
  - .5 PV - Performance Verification.
  - .6 TAB - Testing, Adjusting and Balancing.
  - .7 WHMIS - Workplace Hazardous Materials Information System.

**1.2 GENERAL REQUIREMENTS**

- .1 Standard letter size paper 216 mm x 279 mm.
- .2 Methodology used to facilitate updating.
- .3 Drawings, diagrams and schematics to be professionally developed.
- .4 Electronic copy of data to be in a format accepted and approved by Departmental Representative.

**1.3 APPROVALS**

- .1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

**1.4 GENERAL INFORMATION**

- .1 Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM.
  - .1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
  - .2 Summary of architectural, structural, mechanical, electrical and security systems installed and commissioned - as indicated in Section 1.4 of BMM.

- .3 Information on operation and maintenance of architectural, structural, mechanical, electrical and security systems and equipment installed and commissioned - Section 2.0 of BMM.
- .4 Operating and maintenance manual - Section 3.2 of BMM.
- .5 Final commissioning plan as actually implemented.
- .6 Completed commissioning checklists.
- .7 Commissioning test procedures employed.
- .8 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.
- .9 Commissioning reports.

### **1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL**

- .1 Include original manufactures brochures and written information on products and equipment installed on this project.
- .2 Record and organize for easy access and retrieval of information contained in BMM the following documents:
  - .1 Include completed PI report forms, data and information from other sources as required.
  - .2 Inventory directory relating to information on installed systems, equipment and components.
  - .3 Approved project shop-drawings, product and maintenance data.
  - .4 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.
  - .5 Inventory and location of spare parts, special tools and maintenance materials.
  - .6 Warranty information.
  - .7 Inspection certificates with expiration dates, which require on-going re-certification inspections.
  - .8 Maintenance program supporting information including.
    - .1 Recommended maintenance procedures and schedule.
    - .2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

### **1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL**

- .1 Samples of LSC Manual will be available from Departmental Representative.
- .2 Content of Manual:
  - .1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.
  - .2 Intrusion and security breach.
  - .3 Emergency provisions for natural disasters, bomb threats and other disruptive situations.

- .4 Dedicated emergency generators for high security projects, medical facilities and computer systems.
- .5 Emergency control procedures for fire, power and major equipment failure.
- .6 Emergency contacts and numbers.
- .7 Manual to be readily available and comprehensible to non- technical readers.

**1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES**

- .1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:
  - .1 General
    - .1 Finalized commissioning plan.
    - .2 WHMIS information manual.
    - .3 Approved "as-built" drawings and specifications.
    - .4 Procedures used during commissioning.
  - .2 Architectural and structural
    - .1 Inspection certificates.
    - .2 PV reports.
  - .3 Electrical
    - .1 Inspection certificates.
    - .2 TAB and PV reports.
    - .3 Electrical work log book.
    - .4 Charts and schedules.
    - .5 Locations of cables and components.
    - .6 Copies of posted instructions.
- .2 Assist Departmental Representative with preparation of BMM.

**1.8 LANGUAGE**

- .1 English and French Language to be in separate binders.

**1.9 USE OF CURRENT TECHNOLOGY**

- .1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## Part 1 GENERAL

### 1.1 SUMMARY

- .1 Section includes descriptions for demolishing, salvaging, recycling and removing of asphalt paving identified in whole or in part, and for backfilling trenches and excavations resulting from site demolition activities a required by scope of work.

### 1.2 RELATED REQUIREMENTS

- .1 Section 02 41 16 – *Structure demolition*.

### 1.3 REFERENCE STANDARDS

- .1 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Assessment Act, 2012 (S.C. 2012, c. 19, s. 52)
  - .2 Canadian Environmental Protection Act, 1999 (CEPA), c. 33
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### 1.4 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.
- .3 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .4 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - *Waste Management and Disposal*.
- .5 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - *Waste Management and Disposal*.

### 1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate requirements for Waste Management and Disposal for materials being re used or recycled in accordance with section 01 74 19 – *Waste management and disposal*:
  - .1 Remove materials that cannot be salvaged for re use or recycling and dispose of in accordance with applicable codes at licensed facilities.
- .2 Pre-Construction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 - *Project Meetings*; attended by Departmental Representative and Contractor's key personnel to discuss the following:
  - .1 Verify project requirements;

- .2 Review site conditions;
- .3 Coordination with other Subcontractor's affected by work of this Section;
- .4 Examine existing site conditions adjacent to demolition work, prior to start of Work;
- .5 Waste reporting requirements.

## 1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide following submittals before starting work of this Section.
  - .1 Shop Drawings: Submit shop drawings indicating diagrams or details showing sequence of demolition work.
- .2 Informational Submittals: Provide following submittals during course of work:
  - .1 Certificates: Submit copies of certified weigh bills, bills of lading or receipts from authorized disposal sites and re use and recycling facilities for material removed from site on monthly basis.
- .3 Sustainable Design Submittals:
  - .1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005.
  - .2 Construction Waste Management: Submit project CWM Plan highlighting recycling and salvage requirements in accordance with Section 01 74 19 - *Waste Management and Disposal*.

## 1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA and CEAA.

## 1.8 SITE CONDITIONS

- .1 Protect existing site features to remain or identified for salvage or re use; make repairs and restore to a similar condition to existing where damage to these items occurs as directed by Consultant and at no cost to Owner:
  - .1 Remove and store salvaged materials to prevent contamination.
  - .2 Store and protect salvaged materials as required for maximum preservation of material.
  - .3 Handle salvaged materials same as new materials.
- .2 Perform pavement removal work to prevent adverse effects to adjacent watercourses, groundwater and wildlife, and to prevent excess air and noise pollution.
  - .1 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
  - .2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Authorities Having Jurisdiction.
- .3 Protect existing site features and structures, trees, plants and foliage on site and adjacent properties.

**Part 2 PRODUCTS****2.1 EQUIPMENT**

- .1 Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

**Part 3 EXECUTION****3.1 PRÉPARATION**

- .1 Verify extent and location of asphalt identified 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 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .4 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.
- .5 Protection: protect existing pavement not designated for removal, light units, fences and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

**3.2 REMOVAL**

- .1 Remove existing asphalt pavement to lines and grades established by Departmental Representative on site.
- .2 Demolition of pavements, curbs and gutters:
  - .1 Square up adjacent surfaces to remain in place by saw cutting or other method acceptable to Departmental Representative on site.
  - .2 Protect adjacent joints and load transfer devices.
  - .3 Protect underlying and adjacent granular materials where they are exposed and identified to remain.
- .3 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

- .4 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
- .5 Suppress dust generated by removal process.

### **3.3 FINISH TOLERANCES**

- .1 Finished surfaces in areas where asphalt pavement has been removed within +/-5 mm of grade specified but not uniformly high or low.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - *Cleaning*.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - *Cleaning*.
- .3 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand broom as required.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**



**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCE STANDARDS**

- .1 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Assessment Act (CEAA), 2012.
  - .2 Canadian Environmental Protection Act (CEPA), 2012.
    - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
    - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
  - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

**1.3 DEFINITIONS**

- .1 Hazardous Substances: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.
- .2 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .3 Construction Waste Management Plan (CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill.
- .4 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-Demolition Meetings
  - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor's representative and Departmental Representative.
    - .1 Verify project requirements.
    - .2 Verify existing site conditions adjacent to demolition work.
    - .3 Co-ordination with other construction subtrades.
  - .2 Ensure key personnel attend.
- .2 Scheduling
  - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
    - .1 In event of unforeseen delay notify Departmental Representative.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - *Submittal Procedures* and Section 01 74 19 - *Waste Management Disposal*.
- .2 Prior to commencing work, submit a detailed waste reduction plan in accordance with Section 01 74 19 - *Waste Management and Disposal*.
- .3 Provide, monthly, copies of weighing slips, bills of lading, receipts and certifications issued from landfills and authorized reuse / recycling and recycling centers, for all materials removed from the site.
  - .1 Obtain written authorization from the Departmental Representative prior to shipping materials to sites other than Waste Management Centers listed in the Waste Reduction Plan.
- .4 Shop drawings
  - .1 Submit, for review and approval, drawings, diagrams or details indicating the order of demolition, shoring and work and the elements used to do so.
  - .2 Demolition site drawings submitted must bear the seal and signature of a qualified engineer licensed to practice in Canada, in the province of Quebec.
  - .3 Construction Waste Management
    - .1 Submit the waste reduction plan for the project, which must specify the recycling and recovery requirements.

## 1.6 SITE CONDITIONS

- .1 Environmental protection
  - .1 Ensure Work is done in accordance with Section 01 35 43 - *Environmental Procedures*.
  - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
  - .3 Do not bury rubbish waste materials.
  - .4 Protect trees, plants and foliage on site and adjacent properties where indicated.

## Part 2 PRODUCTS

### 2.1 EQUIPMENT

- .1 Equipment and heavy machinery
  - .1 On-road vehicles to: CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations and CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

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**Part 3 EXECUTION**

**3.1 PREPARATION**

- .1 Protection of in-place conditions
  - .1 Work in accordance with Section 01 35 43 - *Environmental Procedures*.
  - .2 Prevent movement, settlement or damage of adjacent fences, walks, paving, trees, parts of existing building to remain.
    - .1 Provide bracing, shoring and underpinning as required.
    - .2 Repair damage caused by demolition as directed by Departmental Representative.
  - .3 Support affected structures and, if safety of structure being demolished or adjacent structures appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
  - .4 Prevent debris from blocking surface drainage system, mechanical and electrical systems which must remain in operation.
- .2 Surface Preparation
  - .1 Disconnect and re-route electrical and telephone service lines entering buildings to be demolished.
    - .1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.
  - .2 Do not disrupt active or energized utilities traversing premises.

**3.2 DEMOLITION**

- .1 Blasting operations not permitted during demolition.
- .2 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
- .3 Remove from open excavations pieces of concrete and masonry broken from demolition work.
  - .1 Do not backfill demolition areas until inspected by Departmental Representative.
- .4 At end of each day's work, leave Work in safe and stable condition.
- .5 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.
- .6 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .7 Remove following materials and equipment and store in location designated by Departmental Representative.
- .8 Use natural lighting to do Work where possible.
  - .1 Shut off lighting except those required for security purposes at end of each day.

### **3.3 CLEANING**

- .1 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .2 Divert excess materials from landfill to site approved Departmental Representative.
  - .3 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project construction.
  - .4 Transport material designated for alternate disposal using approved receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
    - .1 Written authorization from Departmental Representative is required to deviate from receiving organizations listed in Waste Reduction Workplan.
  - .5 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
    - .1 Use approved landfills identified in the Waste Reduction Plan.
    - .2 Written authorization from the Departmental Representative must be obtained in order to move products and materials to landfills other than those indicated in the Waste Reduction Plan.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)/CSA International.
  - .1 CAN/CSA-A23.1-09/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CAN/CSA-O86S1-05 Supplement #1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121-17, Douglas Fir Plywood.
  - .4 CSA O151-17, Canadian Softwood Plywood.
  - .5 CSA S269.1-16, Falsework and Formwork.
  - .6 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork.
- .2 ASTM International
  - .1 ASTM D1751-18, Standard specification for preformed expansion joint filler for concrete paving and structural construction (Nonextruding and resilient bituminous types).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Submit shop drawings for formwork and falsework.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Prepare Shop Drawings in accordance with CSA S269.1 for falsework and CSA S269.3 for formwork.
- .4 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .5 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.
- .6 When slip forming and flying forms are used, submit details of equipment and procedures for review by Departmental Representative.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Waste management and disposal.
  - .1 Sort waste for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.
  - .2 Deliver unused wood to a recycling facility authorized by the Departmental Representative.
  - .3 Send unused plastic to a facility authorized by the Departmental Representative.

- .4 Route unused release agents to an approved hazardous materials collection site authorized by the Departmental Representative.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Formwork materials.
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121 and CAN/CSA O86.
- .2 Tubular column forms: round, spirally wound, polyethylene impregnated virgin kraft interior layer and a waxed exterior, internally treated with release material.
- .3 Asphalt expansion joint 12.5 mm thick, to ASTM D1751.
- .4 Form release agent: biodegradable.
- .5 Release oil: a colorless, biodegradable, kerosene-free mineral oil with a Saybolt Universal viscosity in seconds of at least 70 and a maximum of 110 at a temperature of 40 degrees Celsius of 15 to 24 mm<sup>2</sup> / s, and the open crucible flash point is at least 150 °C.
- .6 Matériaux pour ouvrages d'étalement temporaires : conforme à la norme CSA-S269.1.

## **Part 3 EXECUTION**

### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Before pouring the concrete directly into the ground, level the walls and the bottom of the excavated area, then remove the soil that comes loose.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.
- .7 Formwork surfaces must be treated or brushed with a commercial mold release agent designed to prevent concrete adherence. Forms must be painted before installation, depending on the application rate specified in the product data sheet to be used. The release agent must not come into contact with the reinforcements. The level of the concrete pouring must be delimited by the top of the forms or by a molding.
- .8 Before pouring concrete, clean the forms in accordance with CSA-A23.1 / A23.2.
- .9 Align form joints and make watertight.
  - .1 Keep form joints to minimum.

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- .10 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

### **3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum period after placing concrete.
  - .1 One (1) day for concrete sidewalk, or until concrete reaches a minimal compression resistance of 7 MPa.
- .2 Remove the formwork when the concrete has reached 70% of its design strength. Demonstration of resistance to concrete stripping shall be done at least once per production cycle.
- .3 Forms are considered removed when they are loose and some of them are no longer in contact with the concrete.
- .4 Concrete curing requirements should apply as the formwork is removed if it is removed before the end of the curing period.
- .5 Reuse formwork and temporary shoring, subject to the requirements of CSA-A23.1 / A23.2.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCE STANDARDS**

- .1 American Concrete Institute (ACI).
  - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International.
  - .1 ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - .2 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 CSA International.
  - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA A23.3-14, Design of Concrete Structures.
  - .3 CSA G30.18-09(R2014), Carbon steel bars for concrete reinforcement.
  - .4 CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Reinforcing Steel Institute of Canada (RSIC).
  - .1 RSIC-2006, Reinforcing Steel Manual of Standard Practice.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec of Canada.
    - .1 Indicate placing of reinforcement and.
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
      - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
  - .2 Detail lap lengths and bar development lengths to CAN/CSA A23.3, unless otherwise indicated.



#### 1.4 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Inform Departmental Representative of proposed source of supplied material.

#### 1.5 DELIVERY, STORAGE AND HANDLING

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

### Part 2 PRODUCTS

#### 2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: hot-dip galvanized and barb-shaped bars to CAN / CSA-G164, 400W grade, to CSA-G30.18 (Carbon steel bars for reinforcing concrete)
- .3 Plain round bars: to CSA G40.20 / G40.21.
- .4 Tie wire: annealed and cold drawn steel wire, to ASTM A1064 / A1064M.
- .5 Reinforcing wire: high adherence steel wire in accordance with ASTM A1064 / A1064M.
- .6 Chairs, spacers, bar supports and support wedges: to CSA-A23.1 / A23.2.
- .7 Galvanized protective coating for non-prestressed reinforcements: galvanizing of at least 610 g / m<sup>2</sup>, in accordance with CAN / CSA-G164.
- .8 Mechanical Fittings: subject to authorization by the Departmental Representative.

#### 2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2, SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
  - .1 SP-66 unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

**Part 3 EXECUTION**

**3.1 PREPARATION**

- .1 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

**3.2 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

**3.3 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1/A23.2.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Maintain cover to reinforcement during concrete pour.
- .4 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

**3.4 FIELD TOUCH-UP**

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

**3.5 CLEANING**

- .1 Cleaning during work: carry out cleaning according to section 01 74 00 - *Cleaning*.
  - .1 Leave the places clean at the end of each working day.
- .2 Final Cleaning: Upon completion of work, remove surplus materials, rubbish, tools and equipment from site in accordance with Section 01 74 00 - *Cleaning*.
- .3 Waste Management: sort waste for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00 – *Concrete forming and accessories*
- .2 Section 03 20 00 – *Concrete reinforcing*

**1.2 REFERENCE STANDARDS**

- .1 ASTM International.
  - .1 ASTM C 260/C 260 M-10a (2016) Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2 ASTM C 309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C 494/C 494M-17, Standard Specification for Chemical Admixtures for Concrete.
  - .4 ASTM C 1017/C 1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .2 CSA Group /CSA International.
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06 (R2016), Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings: in accordance with section 01 32 16.19 – *Construction progress schedule – Bar (GANTT) chart*, convene pre-installation meeting prior to beginning concrete works.
  - .1 Ensure key personnel, site supervisor, Departmental Representative, speciality contractor - finishing, forming, concrete producer and testing laboratories attend.
    - .1 Verify project requirements.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Provide testing inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters found.
- .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.

**1.5 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - *Quality Control*.

- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items.
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.

## 1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements.
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Modifying maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2. is prohibited.
    - .2 Deviations submitted for review by Departmental Representative.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - *Waste Management and Disposal*.

## Part 2 PRODUCTS

### 2.1 MATERIALS

- .1 Hydraulic cement: type GUB-SF, to CSA A3001.
- .2 Water: to CSA A23.1.
- .3 Aggregates: to CSA A23.1/A23.2.
- .4 Admixtures:
  - .1 Air entraining admixture: to ASTM C 260.
  - .2 Chemical admixture: to ASTM C 494 and ASTM C 1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

### 2.2 MIXES

- .1 Concrete meeting the requirements of CSA A23.1 / A23.2 is to be used for all work and must meet the following criteria:

- .1 Ensure that the concrete supplier meets the performance requirements defined below and perform the conformity check as indicated in the quality control plan.
  - .2 Class of exposure: F-1.
  - .3 Compressive strength: at least 35 MPa at 28 days.
  - .4 Intended use: Concrete for sidewalk, grade beams and concrete bases in sonotubes.
  - .5 Minimum binding mass: 340 kg / m<sup>3</sup>
  - .6 Type of binder: GUb-SF having at least 8% silica fume.
  - .7 Water / binder maximum ratio: 0.38 to 0.42.
  - .8 Coarse aggregate: 5-20 mm
  - .9 Air content : 5-8 %.
  - .10 Slump : 130 mm ± 30 mm.
  - .11  $\bar{L}$  max : 230 µm.
  - .12 Maximum permeability to chlorine ions: 1000 C.
- .2 Submit a quality management plan to ensure quality control of concrete based on specified performance requirements.
  - .3 Concrete Supplier Certification: The mixing plant and materials must meet the requirements of CSA A23.1.

### Part 3 EXECUTION

#### 3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - *Concrete Reinforcing*.
- .3 During concreting operations.
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitate placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete permitted only after approval of equipment and mix. In the case of the anti-tunnel sidewalk, concrete pumping is mandatory since the sidewalk is located inside the inner perimeter fence.
- .5 Disturbing reinforcement and inserts during concrete placement is prohibited.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .7 Protect previous Work from staining.

#### 3.2 INSTALLATION/ APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.

- .2 Cold Weather Concrete: Comply with the requirements of CSA A23.1 / A23.2.
- .3 Sleeves and inserts.
  - .1 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
  - .2 Confirm locations and sizes of sleeves and openings shown on drawings.

### 3.3 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces, in accordance with CSA A23.1/A23.2.

### 3.4 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1 Straightedge Method.

### 3.5 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.

### 3.6 CLEANING

- .1 Perform cleaning according to section 01 74 00 - *Cleaning*.
- .2 Waste Management: sort waste for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.
  - .1 After receiving written authorization from the Departmental Representative, move unused concrete and concrete components to a local recycling facility.
  - .2 Provide on-site adequate space for the safe washing of concrete trucks.
  - .3 Send unused adjuvants (pigments, fibers) to an approved hazardous material collection site authorized by the Departmental Representative.
  - .4 Disposal of unused additives in sewers, streams, lakes, on the ground, or any other place where it may pose a risk to human health or the environment is prohibited.
  - .5 Take necessary precautions for adjuvants not to contaminate bodies of water or drinking water supplies.
  - .6 If necessary, collect liquid wastes or solidify it with a non-combustible inert material taking all appropriate safety measures.
  - .7 Dispose and eliminate waste in accordance with the requirements of provincial / territorial and federal local regulations.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00, *Common work results for electrical*;
- .2 Section 26 05 34, *Conduits, conduit fastenings and conduit fittings*;
- .3 Section 26 56 19, *Roadway lighting*;
- .4 Section 33 65 73, *Concrete encased duct banks and manholes*.

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM A 775/A 775M-17, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
  - .2 ASTM C 260/C 260M-16, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 CSA Group
  - .1 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-A23.3-14, Design of Concrete Structures.
  - .3 CSA-A23.4-16, Precast Concrete - Materials and Construction.
  - .4 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-13, binders used in concrete
  - .5 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .6 CSA-W47.1 – 09 (R2014), Certification of Companies for Fusion Welding for Steel.

**1.3 DESIGN REQUIREMENTS**

- .1 Design precast elements to CSA-A23.4 to carry handling stresses.
- .2 Design precast elements to carry loads specified in accordance with applicable codes.
- .3 Design connections/attachments of precast elements to load/forces specified by Departmental Representative.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Approval and Seal

- .1 The technical drawings of the reinforced concrete base must be approved and sealed by an engineer member of the Ordre des Ingénieurs du Québec.
- .3 Shop Drawings:
  - .1 Submit the required data sheets as well as the manufacturer's specifications and documentation. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions and the limits.
  - .2 Coordinate the bolting circle with the steel pole and / or the safety box.

## 1.5 QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4
- .2 Welding companies certified to CSA-W47.1.

## 1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.

## Part 2 PRODUCTS

### 2.1 CONCRETE BASE FOR LAMPOST

- .1 Trapezoidal reinforced concrete base of dimensions as indicated;
- .2 Arrangement of electrical conduits as indicated;
- .3 Steel rods: to CAN / CSA-G30.18 epoxy resin coated;
- .4 Anchor bolts: to CAN / CSA-G40.21, galvanized;
- .5 25 mm PVC RIGID conduit for ground rod.
- .6 Integrated K-Lock handling device;
- .7 Cement: 35 MPa, in accordance with CAN / CSA-A3001.
- .8 Binder materials: Containing at least 20% by weight of natural pozzolans (N), in accordance with CAN / CSA A3001.
- .9 Water: complies with CSA-A23.1 / A23.2.
- .10 Formwork: complies with CSA-A23.4.

### 2.2 PREFABRICATED ELEMENTS

- .1 Prefabricated elements must be made in accordance with CSA-A23.4.



- .2 Each prefabricated element must bear the date of casting and the corresponding identification mark on the shop drawings and used to specify the location. These marks must be affixed to a part of the visible element or not, once the work is completed.
- .3 Hardware parts suitable for handling prefabricated elements must be provided.
- .4 Anchor design to conform to CAN / CSA-G40.21.
- .5 After forming, the embedded steel anchor rods must be cleaned; they must be retouched with a coating rich in zinc.

### **Part 3 EXECUTION**

#### **3.1 SET UP**

- .1 Install prefabricated elements in accordance with acceptable locations.
- .2 Prior to connection, arrange prefabricated elements in accordance with prescribed lines and levels, within acceptable tolerances.
- .3 The list of points for implementation is provided by the Departmental Representative.

**END OF SECTION**

## Part 1 GENERAL

### 1.1 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
  - .1 CGSB 71-GP-24M-AMEND-77(R1983), Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .3 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701.1-2017, Standard for Thermal Insulation, Polystyrene Boards.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for board insulation and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - *Health and Safety Requirements*. Indicate VOC's during application and curing.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Certificates:
  - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports:
  - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions.
- .6 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

### 1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - *Common Product Requirements* and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect specified materials from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - *Waste Management and Disposal*.

## Part 2 PRODUCTS

### 2.1 INSULATION

- .1 Extruded polystyrene (XPS): to CAN/ULC-S701.
  - .1 Compressive strength: 400 kPa.
  - .2 Compressive modulus (min.): 15 000 kPa
  - .3 Thermal resistance (min.): 0,86 m<sup>2</sup> °C/W
  - .4 Water absorption volume (max. after 96 hours): 0,7%

### 2.2 ADHESIVE

- .1 Adhesive (for polystyrene): to CGSB 71-GP-24M.
- .2 Adhesive must be compatible with board insulation and recommended by board supplier.

## Part 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around fences concrete foundations, accessories, pipes and other protrusions.
- .4 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .5 Offset both vertical and horizontal joints in multiple layer applications.

- .6 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

### **3.3 RIGID INSULATION INSTALLATION**

- .1 Apply adhesive to polystyrene insulation board substrate by notched trowel in accordance with manufacturer's recommendations.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A 53/A 53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A 90/A 90M-13 (2018), Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - .3 ASTM A 121-13 (2017), Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
  - .4 ASTM A653/A653M-18, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Office des normes générales du Canada (CGSB).
  - .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
  - .2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.
  - .3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.
  - .4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.
  - .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA Group (CSA)/CSA International.
  - .1 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33).
- .5 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
  - .1 Safety data sheets (SDSs).
- .6 The Master Painters Institute (MPI) - Architectural Painting Specification Manual – (2014).
  - .1 MPI # 18, Organic Zinc Rich Primer.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-Installation Meetings
  - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative to.
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building subtrades.
    - .4 Review manufacturer's written installation instructions and warranty requirements.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Contractor shall provide shop drawings of motorized barriers, manual barriers and crash bars that meet the design criteria described in sections 2.3, 2.4, 2.5 and 2.6 of this section. Shop drawings may differ from plans if they meet the design criteria and types of maneuvers presented in this section.
- .3 Shop Drawings for motorized barriers, manual barriers and crash bars:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Shop drawings must indicate, for each type of barrier and for the crash bar, the layout of the hardware, the spaces and clearances required, as well as the details and characteristics of the electrical accessories, including voltage, power of the motors, auxiliary controls and wiring diagrams.
  - .3 Identify installation tolerances required, assembly conditions, routing of service lines, locations of operating components, controls and boxes.
- .4 Test reports: submit test reports certifying that products, materials and equipment comply with the physical characteristics and performance criteria.

### 1.4 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for motorized barriers and crash bars and their parts for incorporation into manual.

### 1.5 QUALITY ASSURANCE

- .1 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

### 1.6 DELIVERY, STORAGE AND HANDLING

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

## Part 2 PRODUCTS

### 2.1 MATERIALS

- .1 Chain link fence fabric: according to CAN / CGSB-138.1.
  - .1 Type 1, Class A, (zinc plated after weaving, hot dipped galvanized), minimal wire diameter: 4,8 mm.

- .2 Mesh size: 50,8 mm.
- .3 Height of the fence: Variable, see on construction plans.
- .4 The average zinc coating weight shall not be less than 610 g / m<sup>2</sup> of uncoated wire.
- .5 Minimum tensile strength: 10 000 N.
- .2 Barrier frame and bracing: in accordance with ASTM A 53 / A 53M, standard galvanized steel pipe with an outside diameter of 73 mm or of 42.2 mm for the peripheral frame, as shown on plans.
- .3 Posts: galvanized steel pipes, according to CAN / CGSB-138.2, with a maximum elastic limit of 344 MPa, dimensions shown on plans.
  - .1 Corner post: outside diameter of 168,3 mm, linear density 28,2 kg/m.
  - .2 Straining post: outside diameter of 114,3 mm, linear density 15,9 kg/m.
- .4 Tie wires: 3,7 mm (9 gauge) galvanized steel.
- .5 Tension bars: Galvanized steel, according to ASTM A 653 / A 653M, at least 5 mm x 20 mm.
- .6 Assembly and hardware parts in accordance with CAN / CGSB-138.2, galvanized steel.
  - .1 Galvanized steel tension bar band, minimum 3 mm x 20 mm.
  - .2 Galvanized steel post caps for water tightness, securely fastened to posts and carrying the top rail.
  - .3 Watertight overhead connections to secure top rails and post arms to support barbed wire.
  - .4 Post arms measuring 625 mm in length at a 45-degree angle from the horizontal, with fasteners or niches 450 mm apart to maintain 2 rows of barbed wire.
  - .5 Turnbuckles to be drop forged.
- .7 Zinc Rich Organic Coating: to CAN / CGSB-1.181.
- .8 2,5 mm diameter barbed wire made of galvanized zinc-coated steel in accordance to CAN / CGSB-138.2, with 4 tips every 150 mm.
- .9 Barbed tape consisting of 20 mm x 0.5 mm galvanized steel tape clenched around a galvanized spring steel core wire 2.5 mm in diameter to form a 710 mm nominal diameter concertina coil. When installed, the diameter of the coil stretched should be 630 mm and the space between the loops should not exceed 230 mm. Blades should be 20 mm from one end to the other and the barbed wire should be spaced approximately 45 mm from center to center.
- .10 Grounding Pins: in accordance with Section 26 05 28 – *Grounding secondary*.

## 2.2 FINISHES

- .1 Galvanizing
  - .1 For chain link fabric: to CAN/CGSB-138.1.
  - .2 For pipe: 610 g/m<sup>2</sup> minimum to ASTM A 90.
  - .3 For barbed wire: to CAN/CGSB-138.2.
  - .4 For other fittings: to CAN/CSA-G164.

## 2.3 MOTORIZED SLIDING BARRIERS

### .1 Design criteria

- .1 The motorized sliding barriers must provide a free clearance of 7,5 m or 4,5 m wide as shown on plans and a free height of 4,5 m.
- .2 The motorized sliding barrier must have a three (3) point locking device (bottom, middle and top) or a rack and pinion locking mechanism and a locking column to hang the barrier.
- .3 The locking column shall be provided with an easily accessible manual override mechanism.
- .4 The actuating mechanism and rail must be protected from the weather and heated to operate in all conditions. The teeth of the rack, if any, may not be protected, but they must be oriented downwards and visible to the operator of the mechanism.
- .5 External perimeter motorized sliding barrier and associated crash bars must be designed to support additional weight.
- .6 A guide rail must be installed under the barrier.
- .7 Motors must be installed near the ground to ensure easy access for maintenance.
- .8 All barrier components must be galvanized.

### .2 Types of maneuver

- .1 Depending on the type of operation, the motorized sliding barriers must be equipped with the following equipment.
  - .1 Electric operation, using an electric door opener.
- .2 The movement of the door from a closed position must only be possible electrically or mechanically.
- .3 Sliding doors must be equipped with a system limiting the closed and open position of the door.
- .4 Sliding doors must not be able to be opened simultaneously.
- .5 Sliding doors must be interlocked to prevent them from being unlocked simultaneously.
- .6 External and internal perimeter sliding doors must be manually lockable.

### .3 Electric door openers

- .1 Electric motors, control devices, pushbutton remote controls, relays and other electrical equipment: CSA and ULC approved.
- .2 Motor capable of operating a sliding barrier at a speed of up to 500 mm per second. The speed must be adjustable and can be chosen by the operator on site.
- .3 The motor must be protected against overloads.
- .4 Operating devices
  - .1 Push button remote control stations
- .5 Brake designed to stop and hold the door in any position.



- .6 Auxiliary maneuver: hand-cranked, at ground level, to disengage the engine and maneuver the doors manually.
- .7 Safety contacts: electromechanical or electropneumatic devices placed in the bottom rail of the doors and over the entire length of the latter, intended to cause the stop and the immediate reassembly of the door on detection of an obstacle.

## **2.4 CRASH BARS**

- .1 Crash bars are attached to the sliding gates or rack rail and must be remotely controlled at the same time as the sliding gates.
- .2 Crash bars must be made of an I-steel beam or rectangular bars placed on heavy-duty anti-friction rollers. A 6804-kg vehicle traveling at 48,3 km/h must be rendered unusable after hitting the bar in a test equivalent to obtaining US Department of State (K4) certification.
- .3 The crash bar must be supported by a minimum of three (3) heavy supports that also serve as protection for the external perimeter fence. The safety bar must always rest on two (2) heavy supports, in open or closed position.

## **2.5 MANUAL SLIDING BARRIER**

- .1 Design criteria
  - .1 The manual sliding barrier must provide a clearance of 4.9 m wide by 4.5 m high.
  - .2 The manual sliding barrier must have a closing device in three (3) points (bottom, middle and top).
  - .3 The rail must be able to support the weight of the barrier and all accessories.
  - .4 All barrier components must be galvanized.
- .2 Types of maneuver
  - .1 Sliding doors must be equipped with a system limiting the closed and open position of the door.
  - .2 External and internal perimeter sliding doors must be manually lockable.

## **2.6 MANUAL 2 DOOR SWING GATES**

- .1 Design criteria
  - .1 Swing gates must provide a clearance of 4 m wide.
  - .2 The swing gate for vehicles must have a closing device in three (3) points (bottom, middle and top).
  - .3 All barrier components must be galvanized.

# **Part 3 EXECUTION**

## **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for automatic entrances installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.

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

### **3.2 INSTALLATION**

- .1 Install motorized sliding barriers in accordance with manufacturer's instructions.
- .2 Install electric motors, control devices, push-button control stations, relays and all other electrical equipment required to operate motorized sliding barriers.
- .3 Also install all necessary power wiring from the connection point near each barrier.
- .4 Adjust moving parts so that sliding barriers operate smoothly.

### **3.3 FIELD QUALITY CONTROL**

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Schedule site visits to review Work at stages listed.
  - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
  - .2 Twice during progress of Work at 25% and 60% complete
  - .3 Upon completion of Work, after cleaning is carried out.

### **3.4 CLEANING**

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - *Cleaning*.
  - .1 Clean galvanized steel surfaces according to the manufacturer's instructions.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.

### **3.5 PROTECTION**

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

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00, *Documents and samples to submit*
- .2 Section 01 74 00, *Cleaning*
- .3 Section 01 74 19, *Waste management and disposal*
- .4 Section 01 45 00, *Quality control*

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA-listed International
  - .1 CSA C22.1-15, Canadian electrical Code, Part One (23rd edition), Safety standard for electrical installations.
  - .2 CAN/CSA – C22.10 – 10 Quebec Building Code – Chapter V – Electricity – Canadian electrical Code, Part 1 and amendments to Quebec
  - .3 CAN/CSA – C22.2, No. 0-10 (C2015), general requirements-Canadian electrical Code, part two.
- .2 Correctional Service Canada
  - .1 Technical criteria for correctional institutions, April 2015
- .3 IESNA Standards (illuminating Engineering Society of North America)
  - .1 Criteria IESNA HB – 10, lighting Handbook, Reference & Application.
  - .2 IESNA LM – 63 – 02, approved Standard File Format for the Electronic Transfer of photometric Data and related Information.
  - .3 IESNA LM–79–08, Approved Method for Electrical & Photometric Measurement of Solid–State Lighting Products.
  - .4 IESNA LM–80–08, Approved Method for Measuring Lumen Maintenance of LED Light Sources.
  - .5 IESNA LM–82–12, Approved Method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function Temperature.
  - .6 IESNA TM–15–11, Luminaire Classification System for Outdoor Luminaires.
  - .7 IESNA TM–21–11, Projecting Long Term Lumen Maintenance of Led Light Sources.
  - .8 IESNA RES–1–16, Measure and Report Luminaire Dirt Depreciation (LDD) in LED Luminaires C519–2014 IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems.

- .4 American National Standards Institute (ANSI) standards
  - .1 ANSI C519 – 2014 IEEE recommended Practice and requirements for harmonic Control in Electric Power Systems.
  - .2 ANSI C82.77.2002, harmonics Emission Limits – Related Power Quality Requirements for Lighting Equipment.
  - .3 ANSI/IES RP–16–10, Nomenclature and Definitions for Illuminating Engineering.
  - .4 ANSI/IES RP–08–2014, Roadway Lighting
- .5 Transportation Association of Canada (ATC/TAC)
  - .1 Road Lighting Systems Design Guide (2006).
  - .2 Guide on energy consumption reduction and lighting efficiency.

### 1.3 DEFINITIONS

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

### 1.4 DESIGN REQUIREMENTS

- .1 The operating voltages must conform to the CAN3-C235 standard.
- .2 Lighting fixtures, control/controlling/regulating and distribution devices shall operate satisfactorily at the frequency of 60 Hz and within the limits set out in the above-mentioned standard.
  - .1 The lighting fixtures must be able to operate without damage in the extreme conditions defined in this standard.
- .3 Language of operation and display: provide for the identification and display, nameplates and labels in French.

### 1.5 CLOSEOUT SUBMITTALS

- .1 Submit the required documents and samples in accordance with section 01 33 00 - Documents *and samples to be submitted*.
- .2 Shop Drawings
  - .1 The drawings shall bear the seal and signature of a competent engineer authorized to practice in the province of Quebec, for the following items :
    - .1 Lighting pole
    - .2 Console
    - .3 Concrete Base
    - .4 Manhole

- .2 Submit drawings of the following items:
  - .1 Lighting fixture
  - .2 Wires and Cables
  - .3 Conduits
  - .4 Lighting contactor
  - .5 Photocell
  - .6 Electrical panels and breakers
- .3 Wiring diagrams must indicate the terminal terminals, the internal wiring of each device, and the interconnections between the various devices.
- .4 Submit 6 copies of drawings, at least 216 mm x 280 mm, and technical data sheets to the designer.
- .5 If changes are required, inform the Departmental representative before they are made.
- .6 Quality control: According to section 01 45 00 - *Quality control*.
  - .1 Provide CSA-certified equipment and materials.
  - .2 In cases where CSA-certified equipment cannot be obtained, submit the proposed equipment to the inspection authorities for approval prior to delivery to the site.
  - .3 Submit test results for installed electrical systems and instruments.
  - .4 Permits and rights: according to the general terms and conditions in this contract.
  - .5 Once the work has been completed, submit a load balancing report in accordance with the "on-Site quality control" section of Part 3.
  - .6 Once the work is completed, submit to the Departmental representative the certificate of approval issued by the inspection Authority.

## 1.6 QUALITY ASSURANCE

- .1 Quality Assurance: According to section 01 45 00-*Quality control*.
- .2 Qualification: Electrical work must be performed by qualified electricians, by a master electrician or by an electrician licensed by the province in which the work will be performed According to the competent authorities (RBQ – Régie du Bâtiment du Québec) under the terms of the provincial law concerning training and labor qualifications.
- .3 Site meetings
  - .1 Attend site meetings at the start-up of the project and at each stage of the project.

## 1.7 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: Submit a delivery schedule to the Departmental representative within two (2) weeks of contract.
- .2 Construction/demolition Waste Management and disposal: Sorting waste for recycling in accordance with section 01 74 19 - *Waste management and disposal*.

## 1.8 COMMISSIONING

- .1 Instruct the Departmental representative and operational personnel the facility, the operating mode and maintenance methods about its appliances and components.
- .2 Provide these services sufficient time, providing the number of visits required to commission the equipment and ensuring that the operating personnel are familiar with all aspects of their maintenance and operation.

## 1.9 EXPLOITATION INSTRUCTIONS

- .1 Provide operating instructions for each main system and for each main unit prescribed in the relevant sections. Make sure that all operation and maintenance personnel will be familiar with the installation.
- .2 Operating instructions must include the following:
  - .1 Wiring diagrams, control diagrams, sequence of controls for each main system and for each device.
  - .2 Start-up, adjustment, lubrication, operation and shutdown procedures.
  - .3 Security measures.
  - .4 Procedures to be observed in case of failure.
  - .5 Other instructions, as recommended by the manufacturer of each system or device.

## Part 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

- .1 All devices must be CSA certified. In cases where CSA-certified equipment cannot be obtained, submit the equipment and replacement equipment to the inspection authorities before delivery to the site.

### 2.2 WIRING TERMINATIONS

- .1 Ensure lugs, terminals and screws of the wiring terminals are suitable for copper conductors as well as for aluminum conductors.

### 2.3 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipments with name plates complying with the following requirements:
  - .1 Nameplates: plastic laminate lamicoïd 3 mm thick plastic engraving sheet melamine, black matt white finish face, black white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws].

.2 Sizes as follows:

NAMEPLATE SIZES

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

- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 The indicator plates of the circuit breakers, and of the contactors must indicate the controlled device and the voltage.

## 2.4 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered colored plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and color coding throughout.
- .3 Color coding: to CSA C22.1.

## 2.5 CONDUIT, CABLE AND ELECTRICAL PANNEL IDENTIFICATION

- .1 Color code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colors: 25 mm wide prime color and 20 mm wide auxiliary color.

<u>Type</u>	<u>Prime</u>	<u>Auxiliary</u>
up to 250 V	Yellow	
up to 600 V	Yellow	Green

## 2.6 FINISHES

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

- .1 Paint indoor switchgear and distribution enclosures light gray to The EEMAC 2Y-1 standard.

### **Part 3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

#### **3.2 NAMEPLATES AND LABELS**

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

#### **3.3 CONDUIT AND CABLE INSTALLATION**

- .1 Reuse the existing sleeve for the crossing of walls, for the passage of the new power cables of the peripheral external lighting circuits.

#### **3.4 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centerline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Lighting contactor: 1200 mm.

#### **3.5 CO-ORDINATION OF PROTECTIVE DEVICES**

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

#### **3.6 FIELD QUALITY CONTROL**

- .1 Load Balance:
  - .1 Measure phase current at the panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure the phase voltages at the equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control center, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.



- .2 Carry out the tests of the following elements
  - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Check resistance to ground before energizing.
    - .4 Carry out tests in presence of Departmental Representative.
    - .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .3 Measurement of Lighting Levels
  - .1 Measure, using a light meter, illuminance levels to obtain an average of areas, as shown on board SP-6 Light intensities with pole-mounted light fixtures - isometric view (page SP-47) of the Technical Criteria for Correctional Institutions, as follows:
    - .1 Zone between peripheral fences, an average of 20 lux, with a uniformity less than 3 of the average / minimum ratio.
    - .2 Perimeter interior area, an average of 20 lux, with a uniformity of less than 3 of the average / minimum ratio.
    - .3 Perimeter outer zone, an average of 10 lux, with a uniformity of less than 3 of the average / minimum ratio.
    - .4 Perform tests in the presence of the Departmental Representative.
    - .5 Provide measuring devices, indicators, equipment and personnel required for testing during work and completion.
    - .6 The initial illumination measurements taken must be approximately 124% above the average, since a Light Loss Factor of 0.81 is applied.

### 3.7 SYSTEMS STARTUP

- .1 Maintain and keep the existing lighting system and the electrical feeders for the cameras and the detections systems in line with all stages of the perimeter fence construction, as describe in section 01 35 13, *Project Procedures Specific to CSC Security Requirements*.
- .2 Coordinate with all the disciplines involved the construction steps.
- .3 At all times, provide lighting via the existing lighting system and/or the new one.

### **3.8 CLEANING**

- .1 Clean and touching up painted workshop surfaces that have been scratched or damaged during transport and installation; Use a paint of the same type and color as the original paint.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - *Common work results for electrical.*
- .2 Section 26 05 21 - *Wires and cables (0-1000 V)*

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA-listed International
  - .1 CSA C22.2 Number 65-13, wire connectors.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Submit in accordance with Section 01 74 19 - *Waste management and disposal.*
- .2 Evacuate all packaging materials from the site and carry them to appropriate recycling facilities.

**Part 2 PRODUCTS****2.1 MATERIALS**

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.
- .3 Connectors for crossing terminals complying with the EEMAC 1Y-2 standard and consisting of the following elements:
  - .1 Connector body and stud clamp for stranded round copper conductors tube bar.
  - .2 Stud clamp bolts.
  - .3 Sized for conductors as indicated.
- .4 Clamps or connectors for armored cable, flexible conduit as required to: CAN/CSA-C22.2 No.18.

**Part 3 EXECUTION****3.1 INSTALLATION**

- .1 Remove insulation carefully one ends of conductors and depending on the case:
  - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
  - .2 Install the light fixture connectors and tighten them. Replace the insulating cap.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCE REQUIREMENTS**

- .1 Section 26 05 00 - *Common work results for electrical.*
- .2 Section 26 05 20 – *Wire and box connectors (0-1000V).*
- .3 Section 26 05 34, *Conduits, fastenings and conduits fittings.*
- .4 Section 33 65 73, *Concrete-encased duct banks and manholes.*
- .5 Section 33 65 76, *Direct buried underground cable ducts.*

**1.2 RELATED STANDARDS**

- .1 CSA C22.2 No3, test method for wires and cables
- .2 CSA C22.2 No. 131 and 174, TECK90 type cable
- .3 XLPE insulation conductor conforming to CSA Standard C22.2 No. 38

**1.3 PRODUCT DATA**

- .1 Provide product data in accordance with Section 01 33 00 - *Submittal Procedures.*

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 19 - *Waste Management and Disposal.*

**Part 2 PRODUCTS****2.1 WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper alloy conductors: size as indicated, with 1000V insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE, Non-jacketed.

**Part 3 EXECUTION****3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - *Common Work Results for Electrical.*
- .2 Carry out tests of loss of voltage under full load and of dielectric strength on wires and cables using methods appropriate to local conditions and approved by the representative of the Ministry and the competent local authorities.

- .3 Perform tests before energizing electrical system.

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Terminate cables in accordance with Section 26 05 20 - *Wire and Box Connectors - 0-1000V*.
- .2 Cable Color Coding: to Section 26 05 00 - *Common Work Results for Electrical*.
- .3 Lace or clip groups of feeder cables at distribution center, pull boxes, and termination points.
- .4 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend.

### **3.3 INSTALLATION OF WIRES**

- .1 In conduit systems in accordance with Section 26 05 34 - *Conduits, Conduit Fastenings and Conduit Fittings*.
- .2 In buried piping, in accordance with sections 33 65 73 – *Concrete encased duct bank sans manholes* and 33 65 76 – *Direct buried underground cable ducts*;
- .3 In road lighting poles, in accordance with section 26 56 19 – *Roadway lighting*.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 – *Common work results for electrical*

**1.2 REFERENCE STANDARDS**

- .1 Canadian standards Association, CSA C 22.2 No. 41-13 (r2017)

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sorting and recycling waste in accordance with section 01 74 19-*Waste management and disposal*.
- .2 Carry unused metal elements to a metal recycling facility approved by the Department's representative.

**Part 2 PRODUCTS****2.1 EQUIPMENT**

- .1 Grounding collars: Size required, to connect the conductors to a rod.
- .2 Electrode rods: Copper-coated steel, 19 mm in diameter over 3 m in length.
- .3 Electrode plates: Galvanized steel; of an area of 0.2 m<sup>2</sup>, and at least 1.6 mm thick.
- .4 Grounding Conductors: Bare copper, soft annealed, tinned stranded, size indicated
- .5 Grounding conductors under green insulation, type RWU-90.
- .6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Wire Clamp Connectors

**Part 3 EXECUTION****3.1 INSTALLATION GENERAL**

- .1 Install a complete, permanent and continuous grounding system, including the electrodes, conductors, connectors and accessories required for all streetlights.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect the grounding conductors from being exposed to damage.
- .4 Use permanent mechanical connectors or working, controllable copper compression connectors that conform to the ANSI/IEEE 837 standard, buried connections, electrode connections.
- .5 Use mechanical connectors for grounding connections to equipment provided with ground lugs.

- .6 Soldered joints not permitted.
- .7 Install a separate ground conductor for each outdoor lamppost.

### **3.2 ELECTRODES**

- .1 Install the rods and/or electrode plates and make the ground connections.
- .2 Use size 6 AWG copper conductors for connections to electrodes.

### **3.3 EQUIPMENT GROUNDING**

- .1 Make the required grounding connections for all equipment, including: Connecting devices and outdoor lighting systems.

### **3.4 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - *Common work results for electrical*.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00, *Common work results for electrical*;
- .2 Section 26 12 16.01, *Dry type transformers up to 600V primary*;
- .3 Section 26 24 16.01, *Panelboards breaker type*.

### **1.2 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 20th Edition.
  - .2 CSA c22.2 no 40-17, junction and pull boxes.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
  - .1 Product Data of the Cabinet
  - .2 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .3 Provide shop drawings indicating the layout and the positioning of all the electrical equipment inside the cabinet. The drawings must be stamped and signed by professional engineer registered or licensed in Québec Province.

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

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

## **Part 2 PRODUCTS**

### **2.1 CABINETS**

- .1 316L grade stainless steel, 36x30x12 inches, NEMA 4X / 12 welded cabinets with hinged door, two (2) point contact lockable handle provided with two (2) keys, one mounting steel plate white painted, for surface mounting on the towers of the outdoors cameras.



## **2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - *Common Work Results for Electrical*.
- .2 Label size: 4.
- .3 Nameplate wording: Detection and Cameras electrical distribution.

## **Part 3 EXECUTION**

### **3.1 CABINETS INSTALLATION**

- .1 Mount plumb, true and square on towers for outdoor cameras.
- .2 supply and install galvanized steel u-shaped brackets to secure the cabinet.

### **3.2 CLEANING**

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

### **3.3 PROTECTION**

- .1 Protect installed products and components from any damage.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - *Common work results for electrical;*
- .2 Section 28 23 00 - *Video surveillance;*
- .3 Section 28 31 00 - *Intrusion detection;*
- .4 Section 33 65 73 - *Concrete-encased duct banks and manholes.*

### **1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA-listed International
  - .1 CSA C22.2 Number 211.2-06 (R2016), unplasticized polyvinyl chloride rigid ducts.
  - .2 CSA C22.2 Number 56-17, flexible metal conduits and liquid-tight flexible metal conduits.
  - .3 CSA C22.2 Number 83-M1985 (R2017), electric metal tubing.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal.*

## **Part 2 PRODUCTS**

### **2.1 CONDUITS**

- .1 Type DB2 rigid PVC conduits: compliant with CSA standard C22.2 number 211.1.
- .2 RIGID type PVC conduits: compliant with CSA standard C22.2 number 211.2.
- .3 Electrical Metal Tubes (EMT): Compliant with CSA Standard C22.2 number 83, with fittings.
- .4 Flexible metal Conduits: compliant with CSA Standard C22.2 No. 56, aluminum, liquid-tight.

### **2.2 CONDUIT FASTENINGS**

- .1 One-hole steel fixing straps for securing apparent ducts with a nominal diameter equal to or less than 19 mm
  - .1 Two holes steel straps for conduits larger than 27 mm.

### **2.3 CONDUIT FITTINGS**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.  
Coating: same as conduit.

### **2.4 FISH CORD**

- .1 Polypropylene 7mm

## **Part 3 EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Use rigid PVC ducts in the case of underground installations
- .2 Use flexible, liquid-proof metal conduits for connections to the contactor housing.
- .3 Conceal the ducts except those placed in mechanical and electrical installations.
- .4 Use metal electric tubes (EMT) except when the ducts are drowned in concrete structures.
- .5 Use ducts minimum 19 mm for lighting and power circuits
- .6 Install a fish cord in the empty ducts.
- .7 The concreted underground ducts dedicated to CCTV and intrusion detection systems are shown in planes in approximate manner. The design of these systems is not definitive and will be carried out in situ, at the time of construction by the Ministry. The contractor must coordinate with the disciplines concerned and provide the necessary conduits for a complete, functional and safe installation. The quantities of ducts indicated on the slip, in linear meter, are approximate. They will be adjusted for end of payment according to the quantities realized.

### **3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not pass conduits through structural members except as indicated.

### **3.4 CONCEALED CONDUITS**

- .1 Install the sloping ducts to ensure the water is drained.

### **3.5 CLEANING**

- .1 Perform cleaning work in accordance with section 01 74 00-*Cleaning*.
- .2 Once the installation work and the performance control have been completed, evacuate the materials and equipment in addition, the waste, the tools and the equipment.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - *Common work results for electrical.*
- .2 Section 26 05 20 - *Wire and box connectors (0 – 1 000 V).*
- .3 Section 26 05 34 - *Conduits, conduit fastenings and conduit fittings.*
- .4 Section 33 65 73 - *Concrete encased duct banks and manholes.*

### **1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA-listed International
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sorting and recycling waste in accordance with the requirements of section 01 74 19 *Waste management and disposal.*
- .2 Evacuate all packaging materials from the site and route them to appropriate recycling facilities.
- .3 Carry unused metal elements and wiring to a metal recycling facility approved by the Department's representative.

## **Part 2 PRODUCTS**

### **2.1 IDENTIFICATION RINGS**

- .1 Wieland's type C locating labels (or an approved equivalence) for cable identification.

## **Part 3 EXECUTION**

### **3.1 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
  - .1 Do not pull spliced cables inside ducts.
- .2 Install multiple cables in duct simultaneously.
- .3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 All cables will be installed in a directly buried or concrete-coated conduit.
- .5 Before pulling cable into ducts and until cables are properly connected, seal ends of cables with moisture seal tape.

### **3.2 FIELD QUALITY CONTROL**

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

- .2 Perform tests using qualified personnel. Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
  - .1 Ensure that terminations and accessory equipment are disconnected.
  - .2 Ground shields, ground wires, metallic armor and conductors not under test.
  - .3 High Potential HI pot Testing.
    - .1 Conduct HI pot testing at 100% of original factory test voltage in accordance with manufacturer's ICEA recommendations.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - *Common work results for electrical.*
- .2 Section 26 29 01 - *Contactors.*

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit the required documents and samples in accordance with section 01 33 00 - *Submittal procedures.*

## **Part 2 PRODUCTS**

### **2.1 PHOTOELECTRIC LIGHTING CONTROL**

- .1 Photoelectric Lighting Controls: to CSA C22.1.
  - .1 Wall mounting.
  - .2 Lighting load ordered from 600w to 120 V.
  - .3 Voltage variation: plus or minus 10%.
  - .4 Temperature range: minus 40 degrees C to plus 40 degrees C.
  - .5 Switching on lights when the illumination level is 5 lx.
  - .6 Switching off lights when the illumination level is 15 lx.
  - .7 Rated for 5000 operations.
  - .8 Options:
    - .1 Normally open: N. O.
    - .2 Sensitivity adjustment.
  - .9 Switching time delay of 30 s.
  - .10 Wall mounting bracket.
  - .11 Color coded leads: size 12 AWG, 460 mm long.

## **Part 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install photoelectric controls in accordance with manufacturer's written instructions and to CSA C22.1.
- .2 The Photocell control, controls the peripheral light contactor, such as the existing control sequence.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 31 - *Splitters, junction, pull boxes and cabinets;*
- .2 Section 26 05 34 - *Conduits, conduit fastenings and conduit fittings;*
- .3 Section 26 24 16.01 - *Panelboards breaker type.*

### **1.2 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA-C22.2 No.47-M90(R2012), Air-Cooled Transformers (Dry Type).
  - .2 CSA C9-17), Dry-Type Transformers.
  - .3 CAN/CSA-C802.2-18, Minimum Efficiency Values for Dry Type Transformers.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for dry type transformers and include product characteristics, performance criteria, physical size, finish and limitations.

### **1.4 CLOSEOUT SUBMITTALS**

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

### **1.5 DELIVERY, STORAGE AND HANDLING**

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



**Part 2 PRODUCTS****2.1 DESIGN DESCRIPTION**

- .1 Design 1.
  - .1 Type: ANN.
  - .2 Single phase, 1000 VA, 600 V input, 120 V output, 60 Hz.
  - .3 Insulation: Class B, 80 degrees C temperature rise.
  - .4 Basic Impulse Level (BIL): standard.
  - .5 Hipot: standard.
  - .6 Average sound level: standard
  - .7 Impedance at 17 degrees C: standard
  - .8 Enclosure: open IP20.
  - .9 Mounting: Into exterior cabinet.
  - .10 Copper windings.
  - .11 Winding configuration to be as noted on drawings.
  - .12 Voltage Regulation to be 4% or better.

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - *Common Work Results for Electrical*.
- .2 Label size: 4.
- .3 Nameplate wording: Xfo 1 kVA.

**Part 3 EXECUTION****3.1 INSTALLATION**

- .1 Mount 1 kVA dry type transformers on the mounting plate into the stainless steel NEMA 4X/12 exterior cabinet.
- .2 Ensure adequate clearance around transformer for ventilation.
- .3 Make primary and secondary connections in accordance with wiring diagram.

**3.2 CLEANING**

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

**3.3 PROTECTION**

- .1 Protect installed products and components from any damage.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 31 - *Splitters, junction, pull boxes and cabinets;*
- .2 Section 26 12 16.01 - *Dry type transformers up to 600V primary;*
- .3 Section 26 28 16.02 - *Moulded case circuit breaker.*

**1.2 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.2 No.29-15, Panelboards and Enclosed Panelboards.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

**1.5 DELIVERY, STORAGE AND HANDLING**

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

**Part 2 PRODUCTS****2.1 PANELBOARDS 250 Volts**

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
  - .1 Install circuit breakers in panelboards before shipment.
  - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

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- .2 30 Amp, 250 V, 2 circuits, NEMA 1, main log only panelboards: bus and breakers rated for 10kA (symmetrical) interrupting capacity.
- .3 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .4 Aluminum bus with neutral of same ampere rating of mains.
- .5 Mains: suitable for clip-on breakers.
- .6 Bolted trim.
- .7 Trim: baked gray enamel.
- .8 Provide two (2) 15A-1p breakers with thermal and magnetic tripping in panelboards.

**PANELBOARDS 347/600 Volts**

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
  - .1 Install circuit breakers in panelboards before shipment.
  - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 125 Amp, 347/600 V, 18 circuits, NEMA 1, with 60A-3P main breaker panelboards: bus and breakers rated for 25kA (symmetrical) interrupting capacity.
- .3 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .4 Aluminum bus with neutral of same ampere rating of mains.
- .5 Mains: suitable for bolt-on breakers.
- .6 Bolted trim.
- .7 Trim: baked gray enamel.
- .8 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .9 Provide six (6) 30A-1p breakers with thermal and magnetic tripping in panelboards.

**2.3 BREAKERS**

- .1 Breakers: to Section 26 28 16.02 - *Moulded Case Circuit Breakers*.

**2.4 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - *Common Work Results for Electrical*.
- .2 Nameplate for each panelboard size 4 engraved distribution panel for cameras and detection systems.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved.

**Part 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Locate panelboards on the mounting plat of the stainless steel outdoor cabinet and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Connect loads to circuits.
- .3 Connect neutral conductors to common neutral bus.

**3.2 CLEANING**

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

**3.3 PROTECTION**

- .1 Protect installed products and components from any damage during construction.
- .2 Repair damage to materials.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - *Common work results for electrical.*

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA-listed International
  - .1 CSA C22.2 No. 5-16, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE, Fifth edition).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2 PRODUCTS****2.1 BREAKERS GENERAL**

- .1 Molded-case circuit breakers, to the standard CSA C22.2 No. 5
- .2 Bolt-on molded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 347/600 Volts circuit breakers to have minimum 25Kv symmetrical RMS interrupting capacity rating.
- .6 120/240 Volts circuit breakers to have minimum 10Kv symmetrical RMS interrupting capacity rating.

**2.2 CIRCUIT BREAKERS**

- .1 GE-branded molded housing and accessories, without equivalence
  - .1 Catalogue No: SELA36AT0060, 60 amperes, 600 Volt, 3 poles;
  - .2 Calibration plug No: SRPE60A60;
  - .3 Lugs set No: TCAL18;
  - .4 Buss Bar set No: AMCB6EBFP;
  - .5 Filler Plates No: AFP3SED;
- .2 Circuit breakers must be new, non-counterfeit or used. They must be affixed with a label indicating the CSA certification.

**Part 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Pre-install the manufacturer's recommended kit of buss bars to maintain panel certification, to receive the circuit breaker;
- .2 Install the circuit breaker in an existing GE, APNB series – “Bolt-on style” Electrical distribution panel, as indicated and as required by the manufacturer.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - *Common work results for electrical*;
- .2 Section 26 09 23.02 – *Lighting control devices - Photoelectric*.

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA-listed International
  - .1 CSA C 22.2 Number 14-13, industrial control equipment

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2 PRODUCTS****2.1 CONTACTORS**

- .1 Contactors: Complies with CSA Standard C22.2 No. 14, NEMA manufacturing standards.
- .2 Contactors: Electrically held, 60 amperes, 600 volts, 3 poles, NEMA type, controlled by an exterior wall mounted 120 Volts photoelectric cell. The nominal half-power contactors are not accepted.
- .3 Unless otherwise indicated, supply contactors with 2 normally open auxiliary contacts and 2 auxiliary contacts normally closed.
- .4 Unless otherwise specified, the contactor must be fitted in a CSA type 1 enclosure.
- .5 The contactor cover must be fitted with the following optional accessories.
  - .1 Red indicator light;
  - .2 Green indicator light;
  - .3 Selector hand-off-automatic.
- .6 Control transformer: 50 VA, 600V-120v, with fuses and fuse holder, mounted in the contactor enclosure.

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - *Common work results for electrical*.
- .2 Size 4 indicator name plate, bearing the name of the load ordered according to the indications.

**Part 3 EXECUTION****3.1 INSTALLATION**

- .1 Install the contactor and connect the auxiliary control device.

**END OF SECTION**



**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 41 00 - *Precast structural concrete;*
- .2 Section 26 05 00 - *Common work results for electrical.*
- .3 Section 26 05 34 - *Conduits, conduit fastenings and conduit fittings;*
- .4 Section 33 65 73 - *Concrete encased duct bank sans manholes.*

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA-listed International:
  - .1 CSA C22.2 Number 206-17, lighting pole;
  - .2 CSA – C22.2 No. 9.0 – 96 (R2016), General requirements for luminaires;
  - .3 CSA – C22.2 No 250.13 – 17, light-emitting diode (LED) apparatus for lighting applications;
  - .4 CSA-G40.21, general requirements for laminated or welded/structural steel construction steel.;
  - .5 CSA-G 40.20-04/G 40.21-F04, requirements for laminated or welded/structural steel construction;
  - .6 CSA-W59-2003, Welded steel construction
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE):
  - .1 ANSI/IEEE C62.41 -1991, recommended practice for surge voltages in Low-Voltage AC Power Circuits.
  - .2 ANSI C82.77.2002, harmonics Emission limits – related Power Quality requirements for lighting equipment.
  - .3 ANSI C136.31 – 2010, Roadway and Area lighting equipment – Vibration Luminaire – 3G.
- .3 ASTM Standards (American Society for Testing and Materials International)
  - .1 ASTM A36/A36M – 12, Standard Specification for Carbon Structural Steel
  - .2 ASTM A123/A123M – 12, Standard Specification for Zinc (Hot – Dip Galvanized) coatings on Iron and Steel Products.
  - .3 ASTM A595 / A595M–11, Standard Specification for Steel Tubes, Low–Carbon or High–Strength Low–Alloy, Tapered for Structural Use
  - .4 ASTM B85 / B85M–10, Standard Specification for Aluminum–Alloy Die Castings
  - .5 ASTM B117–11, Standard Practice for Operating Salt Spray (Fog) Apparatus
  - .6 ASTM F593–13, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- .4 ICES-005, 4TH edition, Radio Frequency Lighting Devices.
- .5 Underwriters ' Laboratories of Canada (ULC)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Approval and Sealed documents
  - .1 The structural drawings of the lamppost (lighting pole, consoles and luminaires) must be approved and sealed by an engineer who is a member of the Order of Engineers of Quebec (OIQ).
- .3 Shop drawings:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets. Documentation shall include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit the complete photometric data for the proposed luminaires, prepared by an independent testing laboratory, under IES format, and have them reviewed by the Departmental Representative.

**1.4 DOCUMENTS/ITEMS FOR COMPLETION OF WORK**

- .1 Provide the departmental representative with complete documentation related to the installation, maintenance (list of spare parts if required), and attach them to the manual mentioned
- .2 Maintenance manual
  - .1 Insert in the Operating and maintenance manual, in addition to all approved shop drawings, a list giving the complete model number of the luminaire, a brief description of the device and its use, as well as the power, the source, color, beam pattern and other useful information.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sorting and recycling waste in accordance with section 01 74 19-*Waste management and disposal*;
- .2 Evacuate all packaging materials from the site and route them to appropriate recycling facilities;
- .3 Place all packaging materials for recycling;
- .4 Carry unused metal elements and wiring to a metal recycling facility;
- .5 Carry concrete and unused concrete components to a local recycling facility approved by the Department's Representative.

**1.6 ACCEPTABLE MATERIALS OR PRODUCTS**

- .1 When materials or products are prescribed by their trade-mark, refer to the Instructions to bidders for information on the application for approval of materials or replacement products.

**Part 2 PRODUCTS****2.1 STEEL POLES**

- .1 Steel pole compliant with the CAN/CSA G40.21 Standard, designed for underground feeding and having the following characteristics:
  - .1 Pole to be mounted on concrete base with and without base for transformer, as indicated;
  - .2 Pole Type: In interior and exterior galvanized steel, single piece, octagonal, 9 m high, conical from 200 mm to 89 mm, wall thickness of at least 3.0 mm, bolting circle of 280 mm.
  - .3 Pole having two consoles for luminaires, of length according to the indications;
  - .4 100 mm x 200 mm hand hole, located 450 mm above base, with welded reinforcement frame and bolted cover, for electrical connections;
  - .5 Four steel anchor bolts, 25 mm x 1200 mm, with shims, nuts and caps;
  - .6 Finish coating: Brushed galvanized;
  - .7 Vibration damper inside the pole;
  - .8 Manufacturer's label indicating model, serial number and product characteristics
  - .9 The lamppost must withstand winds of 160 km/h and overloads of ice that may occur in the area where the facility is located;
  10. To coordinate the shaft bolting circle with the concrete base;
  11. Acceptable product:
    - .1 Model No: OT-30-HDG by the company Valmont.
    - .2 Model No: S-OC0103 by the company Génilux.
    - .3 Replacement materials or products: approved by addendum in accordance with Instructions to bidders.

**2.2 LUMINAIRE MOUNTING BRACKETS**

- .1 Mounting brackets steel for specified luminaires:
  - .1 Single and twin arms as indicated.
  - .2 Arm extension length: 2.4 m.
  - .3 Curved steel Tube Having an overall diameter of 83 mm and 4.7 mm thick;
  - .4 Double tapered davit type.
  - .5 Acceptable product:
    - .1 Model No: HDG-2, 4m by the company Valmont.
    - .2 Model No: S-PE0113 by the company Génilux.
    - .3 Replacement materials or products: approved by addendum in accordance with Instructions to bidders.

- .2 Galvanized steel brackets suitable for the type of Luminaire prescribed and having the following characteristics.
  - .1 Simple and semi-detached arms, as indicated;
  - .2 Extension arm of 1.0 m in length;
  - .3 Curved steel Tube Having an overall diameter of 83 mm and 4.7 mm thick;
  - .4 Double Arm
  - .5 Acceptable product:
    - .1 Model No: HDG-1, 40m from by the company Valmont.
    - .2 Model No: S-PE0113 by the company Génilux.
    - .3 Replacement materials or products: approved by addendum in accordance with Instructions to bidders.

### 2.3 LUMINAIRES

- .1 LED Luminaire with cast aluminum casing, weather-proof, having the following characteristics
  - .1 LED-type with a maximum power of 110 W;
  - .2 Mounted on stem – 83 mm tube;
  - .3 Service life of 100 000 hours;
  - .4 Color temperature of 4 000 degrees K
  - .5 Color rendering index (IRC) of 70;
  - .6 A photometric distribution of type 3 – medium;
  - .7 Intensity of 11 000 lumens minimum;
  - .8 Grey painted aluminum case with an index of protection (IP) of 66;
  - .9 Case resistant to a 3g vibration force;
  10. A surge suppressor up to 10 kV/10 KA;
  11. A 347 V high power Factor driver, Class 1, and a harmonic distortion rate of less than 20%;
  12. Automatic latches, stainless steel and aluminum
  13. Factory pre-wired luminaires with built-in pilot, ready to be connected by the terminal block;
  14. Driver access must be done easily and quickly without tools;
  15. Maximum weight of the complete unit: 12 kg;
  16. Maximum EPA area: 0.1 square meter;
  17. Acceptable product:
    - .1 Model No: RFM-108w48LED4KT-R3M-HVU-SP2-GY3 by the Philips Company. Apply + 5 degrees Tilt.
    - .2 Model No: BXSP-C-HT-3rd-F-40k-UH-347V-SV-G-Label, by the Cree company. Apply + 5 degrees Tilt.
    - .3 Model No: ERLH-D-13-C3-40k-D-Gray-IP66-L-R, Evolve by the GE company. Apply + 5 degrees Tilt.
    - .4 Replacement materials or products: approved by addendum in accordance with Instructions to bidders.

**2.4 FUSE HOLDER**

- .1 The fuse holders must be made of a rubberized, weather-proof material. They must be assembled in such a way as to interrupt the voltage on one (1) phase. When opening, the fuses must remain in place with the part connected to the loaded side, avoiding the bare part from being able to present any danger.
- .2 The assembly of the fuse holders must be made according to the manufacturer's recommendations. The fuse holders are connected to the RWU-90 conductors.
- .3 The fuses are of type KTK, fast acting. The size of the fuses is to be as recommended by the luminaire manufacturer.

**2.5 SAFETY BOX**

- .1 600 mm high trapezoidal galvanized steel casing.
- .2 Bolted hands holes
- .3 Grounding lug
- .4 Bolting circle height: 280 mm
- .5 Low bolting circle: 350 mm
- .6 Acceptable product
  - .1 Model No: HDG-TB-24 by the company Valmont.
  - .2 Model No: TBS-14-17-steel by the company Génilux.
  - .3 Replacement materials or products: approved by addendum in accordance with Instructions to bidders.

**Part 3 EXECUTION****3.1 DELIVERY**

- .1 Lamppost must be delivered and discharged to the site in their original packaging, well-identified, with reference to the project. The exact delivery location will be determined at the time of delivery.

**3.2 INSTALLATION**

- .1 Install lampposts, complete with arms, luminaires, in level and in accordance with manufacturer's instructions.
- .2 Install luminaires on arms.
- .3 Check luminaire orientation, level and tilt.
- .4 Connect luminaires to lighting circuits.
- .5 Perform tests in accordance with Section 26 05 00 - *Common work results for electrical*.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCES**

- .1 “Detail specification for 50- $\mu$ m core diameter/125- $\mu$ m cladding diameter class of graded-index multimode optical fibers. ANSI/TIA-492AAAB-A-2009, Optical fiber cable color coding”;
- .2 EIA Fiber Optic Test Procedures. EIA / TIA-455-46, -61 or -53;
- .3 “Mechanical and Environmental Specification for Outdoor Fiber Optic Cable. CSA / C22.2 n°232”;
- .4 Canadian Electrical Code. CSA C22.10-2015;
- .5 TIA 569: Telecommunications Pathway and Spaces;
- .6 ANSI/TIA-758-A Customer-owned Outside Plant Telecommunications Infrastructure Standard;
- .7 TIA-607-B Generic Telecommunications Bonding and Grounding - RAQI.

**1.2 DOCUMENT / DOCUMENTS FOR APPROVAL / INFORMATION**

- .1 Submit required documents and samples in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Shop drawings must show or indicate the following:
  - .1 Fiber optic cable;
  - .2 Fiber optic pigtail splicing cable;
  - .3 Fiber optic connector;
  - .4 Fiber optic enclosure;
  - .5 Fiber optic adapter panel;
  - .6 Fiber optic splice tray;
  - .7 Fiber optic patch cord;
  - .8 SFP module.

**Part 2 PRODUCTS****2.1 FIBER OPTIC CABLE**

- .1 Multimode type optical fibers with a nominal diameter of 50 $\mu$ m (OM3).
- .2 Fiber optic cable characteristic's :
  - .1 The cable must comply to the environmental constraints, with the standards "CSA / C22.2 No. 232 and Bellcore Technical Reference TR-TSY-000020";
  - .2 The cable must have the following characteristics:
    - .1 Wavelength 850 - 1300 nm;
    - .2 Fibers count: 12;
    - .3 Operating temperature range: -40 °C to 70 °C;
    - .4 Installation temperature range: -30 °C to 70 °C;
    - .5 Polyethylene (PE) jacket.

- .3 The cable length must be in meter;
- .4 The fiber color code of each fiber must conform to the recognized standard;
- .5 The cable must be compatible for a buried conduit installation.
- .3 The cable Performance:
  - .1 Each fiber must meet the following specifications:
    - .1 Maximum attenuation:
      - .2 850nm : 3db/km;
      - .3 1300nm : 1db/km.
    - .4 Minimum transmission capacity: 1 Gb over 1000m.

## 2.2 FIBER OPTIC PIGTAIL SPLICING CABLE

- .1 Must be prefabricated in the factory;
- .2 Must be compatible with the junction box;
- .3 UPC compatible ceramic adapter;
- .4 12 pigtail module and 12 SC ports;
- .5 Designed for 50  $\mu$ m OM3 multimode type optical fiber;
- .6 The optical primer cable must be approximately 3 meters;
- .7 Fiber optic connector :
  - .1 Connectors must be of the SC, UPC type, on the fiber optic primer cables;
  - .2 Connectors must be compatible with multimode 50  $\mu$ m OM3 fibers;
  - .3 Connectors must be made of ceramic ferrule;
  - .4 The connectors must meet the following criteria :
    - .1 Guaranteed durability for 500 cycles with variation of less than 0.2 dB;
    - .2 Breaking strength of 0.5 kg with variation of less than 0.2 dB;
    - .3 Maximum insertion loss of 0.5 dB;
    - .4 Minimum reflectance -25 dB;
    - .5 Operating temperature range: -40 °C to 70 °C;
    - .6 All connectors must be fitted with dust caps.

## 2.3 FIBER OPTIC ENCLOSURE

- .1 Compatible with EIA / ECA-310-E (2005);
- .2 Allow the splice and the connection of 24 multimode optical fibers, 50/125  $\mu$ m, OM3;
- .3 Compatible with "SC" connector modules;
- .4 For installation in the control room :
  - .1 Compatible for installation in a 19-inch rack
- .5 For installation in outdoor equipment boxes:
  - .1 Compatible for wall installation.

**2.4 FIBER OPTIC ADAPTER PANEL**

- .1 The panel housing must meet or exceed the following requirements:
  - .1 Must be compatible with the optical housing;
  - .2 12 SC connectors for multimode 50 µm OM3 optical fiber.

**2.5 FIBER OPTIC SPLICE TRAY**

- .1 The boards must be compatible for multimode 50 µm OM3 optical fiber;
- .2 Compatible with the patch panel.

**2.6 FIBER OPTIC PATCH CORD**

- .1 Must be compatible with multimode 50 µm OM3 optical fiber;
- .2 Patch cord must be duplex, LC - SC (for installation between SFP modules of the switch (LC connector) and optical patch panel equipped with SC connectors);
- .3 Maximum insertion attenuation: 0.3 dB;
- .4 Reflection attenuation > 20 dB;
- .5 Cord length: as required.

**2.7 SFP MODULE**

- .1 SFP modules must be compatible for 50 µm OM3 multimode fiber;
- .2 SFP modules must be compatible with switches (LNP-1002GN-T);
- .3 Minimum data transfer speed: 1 Gb;
- .4 Operating temperature: -35 °C to 70 °C.

**Part 3 EXECUTION****3.1 REQUIREMENTS OF THE TELECOMMUNICATIONS CONTRACTOR**

- .1 Contractor License
  - .1 The supplier, who specializes in telecommunication cabling installation, must hold a RBQ 4250 license and be able to certify the performance of the telecommunications cabling network from a recognized manufacturer. A copy of the valid license for the period of completion of the mandate must be provided before the start of the work. In the event that the license expires during the term of office, it must be renewed, and a copy of the renewal must be provided.
- .2 Provider experience in cabling
  - .1 Minimum five (5) year experience in structured cabling installation with certification from the cable manufacturer.

**3.2 SUPPLY**

- .1 Supply and install cables of 12 multimode optical fibers, according drawing, connecting the optical patch panels:
  - .1 Include a 10 meters loop of optical fiber at each end of the fiber optic cable, before terminating at the fiber optic enclosure.



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- .2 Supply and install a fiber optic enclosure with 24 positions fiber optic adapter panel, with SC connectors, in the 19 inches rack, in the control building;
- .3 Provide and install five (5) wall mount fiber optic enclosures into the equipment housings of the camera network switches;
  - .1 Provide and install fiber optic adapter panel for fiber optic enclosure (to have 24 SC adapters;
- .4 Provide and install the required splicing tray in the fiber optic enclosure;
- .5 Provide the fiber optic pigtails and make the required splices in the splicing tray. All cables must be terminated on the fiber optic adapter panel;
- .6 Provide and install the required SFP modules in the camera communication switches (to allow a ring topology);
- .7 Provide and install fiber optic patch cords between fiber optic adapter panel and the camera communications switches.

### **3.3 INSTALLATION**

- .1 Fiber optic cable installation
  - .1 Install fiber optic cable inside new concrete blocks and existing underground conduits;
  - .2 Use a pulling net designed for pre-connected optical fiber cables;
  - .3 Use a swivel ring to avoid unnecessary twisting of the cable during installation;
  - .4 The Contractor must respect the installation and tensile strength requirements recommended by the manufacturer and based on the codes and standards.
- .2 Protection
  - .1 Protect installed equipment and components from damage during construction.
- .3 Cable splicing
  - .1 Proceed with the fusion of the fibers according to the applicable codes and standards;
  - .2 Use a quality fusion splicing machine ;
  - .3 Install the fiber optic connection elements according to the manufacturer's instructions;
  - .4 Install the components securely, at the locations shown on the revised shop drawings.

### **3.4 FIBER OPTIC CABLE TEST**

- .1 Manufacturer's test
  - .1 The manufacturer must perform an end-to-end fiber attenuation test for each fiber at the plant;
  - .2 The results must be in accordance with EIA / TIA-455-46, -61 or -53;
  - .3 The test instrument shall be calibrated to generate signals at nominal wavelengths (850/1300 nm);

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- .4 Multimode LED light sources shall have a maximum spectral width of 30 - 60 nm at 850 nm and 100 - 140 nm at 1300 nm;
- .5 Test patch cord must be of the same diameter (50  $\mu$ m) as the fiber.
- .2 Testing at reception
  - .1 Upon receipt of fiber optic cable rolls, a visual inspection as well as a full test, using end-to-end OTDR testing equipment for each fiber will be performed by the supplier, before installation. In addition, a visual inspection will be performed by the customer representative prior to installation.
  - .2 A detailed report of these tests will have to be provided. In the event that the results of these tests do not meet the expected minimum performance, the supplier must make the necessary corrections to comply with the requirements of this specification. No splice will be accepted on the new fiber.
- .3 Tests after installation of fiber cable
  - .1 After installation of the cable, the Contractor shall perform the final tests using OTDR test equipment and provide the customer representative with a detailed test report;
  - .2 Provide 1 km buffer fiber length at each end for all tests;
  - .3 The spectral width of the transmitter shall be  $\leq$  10 nm;
    - .1 These measurements are made at the wavelength corresponding to the operating wavelength: 850 nm and 1300 nm;
    - .2 Provide a compliance report with the following results;
    - .3 End-to-end attenuation (in dB);
    - .4 Attenuation of each connector and each fusion present on the fiber network (in dB);
    - .5 Complete trace of distance attenuation showing the total length of the measured segment provided by the OTDR (in graphical form).
  - .4 In the event that the results of these tests do not meet the expected minimum performance, the Contractor must make the necessary corrections to comply with the requirements of this specification (no intermediate splice will be accepted on the new fiber).

#### **Part 4 ADDITIONAL TECHNICAL INFORMATION**

##### **4.1 DATA SHEETS**

- .1 Provide a detailed technical sheet of the proposed cables and a physical representation in section showing the construction of the cables;
- .2 Provide an installation checklist.

##### **4.2 TOXICOLOGICAL SHEET**

- .1 Provide a detailed toxicological data sheet of the proposed cable.

##### **4.3 CODE OF COLORS**

- .1 The contractor must specify the color code used for fiber identification.

**4.4 GUARANTEE**

- .1 The contractor must specify the guarantee offered on the cables (cover, duration, etc.).

**END OF SECTION**

**Part 1. GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - *Common Work Results for Electrical.*
- .2 Section 26 05 34 - *Conduits, Conduit Fastenings and Conduit Fittings.*
- .3 Section 33 65 73 - *Concrete Encased Duct Bank and Manholes.*

**Part 2. PRODUCTS****2.1 NOT APPLICABLE**

- .1 Not applicable.

**Part 3. EXECUTION****3.1 DESCRIPTION**

- .1 Empty Telecommunications conduits includes outlet boxes and covers, 102mm ducts, pull boxes, sleeves and caps, pull wires, service accessories and ducts embedded in concrete.
- .2 The materials and work to be supplied are described and carried out in the electrical section..

**3.2 SUPPLY**

- .1 The supply section is under the electrical section of the project.

**3.3 INSTALLATION**

- .1 Install the empty pipe network and all equipment necessary to connect the existing equipment boxes as shown on the drawings;
- .2 Install the piping elements according to the manufacturer's instructions;
- .3 Install the components securely at the locations shown on the revised shop drawings.

**3.4 PROTECTION**

- .1 Protect installed equipment and components from damage during construction.

**3.5 INSPECTION OF WORK**

- .1 Inspect the installation work of the piping systems at each stage of the work and at the end of the installation work of the materials. At each inspection, submit an inspection report including, but not limited to, the following information:
  - .1 The extent of the work audited;
  - .2 Verification of the configuration of each duct network per system;
  - .3 Verification of the installation of the different equipment of each network according to the indications to the drawings;
  - .4 Verification of the type of duct and the installation according to the application;
  - .5 Verification of equipment identification by network as indicated.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCE**

- .1 Canadian Electrical Code (CEC).

**1.2 WORKSHOP DRAWINGS**

- .1 The workshop drawings must include the technical data sheets of the equipment that will be used.
  - .1 Speaker
  - .2 Copper cable
  - .3 Connection box for loudspeaker

**1.3 DOCUMENTS / COMPLEMENTS TO COMPLETE THE WORK**

- .1 The documents to be submitted must include the following:
  - .1 List of all components of a system or subsystem, listing each component by name and model number designated by the manufacturer;
  - .2 List of parts with identification numbers used in the electronics industry to designate the different elements.

**1.4 COMMISSIONING AND ACCEPTANCE**

- .1 Verification of the operation of each loudspeaker shall be done in coordination with the operator;
- .2 Instruct maintenance personnel regarding the maintenance of the system;
- .3 Instruct operating personnel on any changes to the way the system is used.

**Part 2 PRODUCTS****2.1 MATERIALS**

- .1 Copper cable
  - .1 Copper cables will be installed to make the physical connections between the control building, the various installations (or equipment) and the cabinets.
  - .2 A dedicated color code for each zone will be determined before the construction phase.
  - .3 Copper cables must meet or exceed the following requirements:
    - .1 Category 3;
    - .2 Resistant to UV rays;
    - .3 For aerial or outdoor installation;
    - .4 With polyethylene insulation;
    - .5 19 AWG conductors;
    - .6 Number of pairs: 25.

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- .2 Sound reproduction equipment;
- .3 Trumpet-type speakers;
- .4 Mounting hardware for installation on the new inner fence;
- .5 Finish: white color;
- .6 Weatherproof outdoor housing (IP65);
- .7 Mains transformer: 70 V nominal primary voltage and secondary outlet for volume adjustment;
- .8 Frequency range: 250 - 10000 Hz;
- .9 Impedance: 70 ohms;
- .10 Power equal to or greater than the speakers currently in place.

### **Part 3 EXECUTION**

#### **3.1 DESCRIPTION OF THE SYSTEM**

- .1 As part of this project, the paging and amplification system will be maintained. The work consists of the following actions:
  - .1 Replacement of loudspeakers, outside wiring and infrastructure for their installations;
  - .2 The new elements will be installed on the new interior fence.

#### **3.2 INSTALLATION**

- .1 Install the equipment according to the instructions and according to the manufacturer's instructions;
- .2 Install the equipment as indicated in the drawing (drawing to be provided by SCC).

#### **3.3 QUALITY CONTROL ON SITE**

- .1 Perform the operational tests in coordination with the operator;
- .2 The dismantling of old loudspeakers in a zone can only be done after commissioning and acceptance of the new loudspeakers in this zone by the operator;
- .3 Submit the system to intelligibility tests.

**END OF SECTION**

**Part 1 GENERAL****1.1 CCTV SYSTEMS**

1. As part of this project, existing cameras will be retained;
2. Some cameras will have to be moved in order to ensure an optimal line of sight in the corridors, between the new fences, following their installation.

**1.2 DOCUMENT / DOCUMENTS FOR APPROVAL / INFORMATION**

1. Submit required documents and samples in accordance with Section 01 33 00 - *Submittal Procedures*.
2. Shop drawings must show or indicate the following:
  1. Extension plate;
  2. Ethernet cabling;
  3. Electrical wiring.
3. Data Sheets
  1. Submit the required data sheets as well as the manufacturer's instructions and documentation regarding intrusion detection devices. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.

**1.3 TRANSPORT, STORAGE AND HANDLING**

1. Transport, store and handle equipment and materials in accordance with the General Product Requirements and the manufacturer's written instructions;
2. Delivery and acceptance: deliver the equipment and materials to the work site in their original packaging, which must be with a label indicating the name and address of the manufacturer;
3. Warehousing and handling:
  1. Store equipment and materials in a clean, dry, well-ventilated area as recommended by the manufacturer;
  2. Store equipment and intrusion detection materials to protect them from marks, scratches;
  3. Replace damaged equipment and materials with new materials and equipment.

**Part 2 PRODUCTS****2.1 EXTENSION PLATE FOR CAMERAS**

1. The plates shall be hot dip galvanized steel;
2. All openings must be covered with 2 coats of paint with a high zinc content;
3. The plates must ensure the stability of the cameras so as not to affect the quality of viewing during strong winds and gusts;

4. The plates will have to support the following equipment's:
  1. Surveillance camera with lens;
  2. Camera: WV-SPN311;
  3. Lens: PLZ15-50 or PLZ5-50;
  4. Heated camera case, ventilated with windshield wiper;
  5. Case: (the case reference will be provided later).

## **2.2 ETHERNET COPPER CABLES**

1. Copper cables and Ethernet jumper RJ-45, will need to be replaced, following the addition of the support extension plates (connection cables between the cameras and the switch in the equipment boxes);
2. Ethernet copper cables must meet or exceed the following requirements:
  1. Category 6;
  2. Solid wire;
  3. Can be installed outdoor, under conduit;
  4. Cables with polyethylene insulation;
  5. Wire size: 23 AWG;
  6. Number of pairs: 4;
  7. Gigabit Ethernet and 100BaseTX compatible;
  8. Cable currently in place: Essex 04-001-68 or equivalent accepted.

## **2.3 ELECTRICAL WIRING AND CAMERA BOXES**

1. When moving the cameras on the extension plates, the power wiring of the camera heaters must be replaced.
2. The camera box power cable must meet the Canadian electrical code for insulation at a voltage of 600V or exceed the following requirements:
  1. Cables: 2 conductors;
  2. Conductor size: 22 AWG;
  3. Multi-strand tinned copper conductor;
  4. Minimum voltage insulation 600V;
  5. Can be buried directly;
  6. Cable currently in place: Provo 889222 or equivalent accepted.



**Part 3 EXECUTION****3.1 REQUIREMENTS FOR THE TELECOMMUNICATIONS CONTRACTOR**

1. Contractor License
  1. The supplier, a specialist in telecommunication cabling and security system installation, must hold a RBQ 4250 license and be able to give a performance certification of the telecommunications cabling network from a recognized manufacturer. A copy of the valid license for the period of completion of the mandate must be provided before the start of the work. In the event that the license expires during the term of office, it must be renewed, and a copy of the renewal must be provided.
2. Provider experience in cabling
  1. Minimum five (5) year experience in structured cabling installation with certification from the cable manufacturer.

**3.2 SUPPLY**

1. Camera extension plates shall be provided for each of the cameras that provide supervision of the corridors between the two fences. The cameras are shown on the plans;
2. It is important to provide continuity of video surveillance services throughout the duration of the works. If additional equipment is required for temporary supervision during the work period, provide, install and configure the equipment accordingly;
3. Any new temporary or relocation camera must be approved by the customer representative and the operator.

**3.3 CHECKS BEFORE WORK**

1. Verification of conditions: prior to moving or installing supervisory devices, ensure that the condition of surfaces / media previously implemented under other sections or contracts is acceptable and allows for the completion of work in accordance with the written instructions of the manufacturer.
  1. Make a visual inspection of the surfaces / supports in the presence of the client's representative;
  2. Immediately inform the client representative of any unacceptable conditions found;
  3. Start installation work only after correcting unacceptable conditions and receiving written approval from the customer representative;
  4. Verification of fields of view: before moving existing cameras, check the current fields of view and take screenshots for reference.

### 3.4 WORKS

1. Comply with the manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins, product catalog instructions, product packaging instructions and data sheet specifications;
2. Install wiring, junction boxes, mounting hardware, brackets, and video cameras according to the manufacturer's written instructions;
3. Install the components securely at the locations indicated on the revised shop drawings;
4. Connect cameras and camera boxes according to the installation instructions;
5. Adjust the field of view of the camera, to maintain a field of view comparable to that before the relocation of the fence;
6. Install ULC labels where required;
7. All work must be done in coordination with the operator.

### 3.5 SETTING

1. Configure the cameras;
2. Check the fields of view, following the displacement of the existing cameras;
3. Check the field of view, take screenshots and compare with the screenshots before work.

Note: *Camera settings must be coordinated with the operator.*

### 3.6 TESTS AND INSPECTIONS ON SITE

1. Perform inspections and tests in the presence of the client's representative;
2. Provide the tools and any equipment needed;
3. Ensure that subcontractors and security experts are present at the time of the audit;
4. Visual inspection: A check to assess the quality of the installation and assembly as well as the overall appearance of the equipment, to ensure that the system is in accordance with the contract documents, and to points below:
  1. Robustness of hardware fixations;
  2. No damage due to installation;
  3. Compliance of device locations with revised shop drawings;
  4. Compatibility of the installation of the equipment with the physical environment;
  5. Supply of all accessories;
  6. Device identification and cabling identification.
5. Technical control: A check to verify that all systems and devices are correctly installed, free of defects and damage, and should address the following points:

1. Measurement of the space covered by the cameras;
  2. Junctions / connections and hardware fixings;
  3. Compliance with manufacturer's specifications, documentation and installation instructions.
6. Operational control: A check to ensure that the performance of devices and systems meets or exceeds established functional requirements and should address the following:
1. Operation of each device, individually and in his environment;
  2. Fields of view and zoom operation when available;
  3. Focusing the image (focus);
  4. Operation of the wiper.
7. Tests for CAT6 cables
1. Ensures that CAT6 cables are installed so that they do not suffer damage from wind or plant vibration in bad weather.
8. Tests for the boxes
1. Ensure the operation of the environmental control (heating) of the housings.

### **3.7 PROTECTION**

1. Protect installed equipment and components from damage during construction work;
2. Repair damage to adjacent materials and equipment when installing the CCTV system.

**END OF SECTION**

**Part 1 GENERAL****1.1 INTRUSION DETECTION SYSTEMS**

- .1 Motion Detection System (MDS);
- .2 Fence disturbance detection system (FDS);
- .3 Wireless detection system.

**1.2 DOCUMENT / DOCUMENTS FOR APPROVAL / INFORMATION**

- .1 Submit required documents and samples in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Shop drawings must show or indicate the following:
  - .1 Brackets for mounting outdoor equipment;
  - .2 Method of attaching equipment to fences, structures or barriers.
- .3 Data sheets:
  - .1 Submit the required data sheets as well as the manufacturer's instructions and documentation regarding intrusion detection devices. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.
- .4 Submit the manufacturer's installation instructions.

**1.3 TRANSPORT, STORAGE AND HANDLING**

- .1 Transport, store and handle equipment and materials in accordance with the General Product Requirement and the manufacturer's written instructions;
- .2 Delivery and acceptance: deliver the equipment and materials to the work site in their original packaging, which must be labeled with the name and address of the manufacturer;
- .3 Warehousing and handling:
  - .1 Store equipment and materials in a clean, dry, well-ventilated area as recommended by the manufacturer;
  - .2 Store equipment and intrusion detection materials to protect them from marks, scratches and scratches;
  - .3 Replace damaged equipment and materials with new materials and equipment.

**Part 2 PRODUCTS****2.1 MOTION DETECTION SYSTEM (MDS)**

- .1 The system must:
  - .1 Be designed to operate in a 7.5m wide zone between 3.6m chain link fences;
  - .2 Be buried;
  - .3 Be terrain following;
  - .4 Support perimeters up to 2000m;

- .5 Include high contrast, outdoor, all weather signage on the outer fence for each sector with at least 30cm high digits
- .2 Gate sensor
  - .1 Given that vehicle passage over a buried sensor can either damage the sensor or suffer reduced sensitivity due to the surface finish, the system must be designed to operate above ground covering the gate opening to ground level.
- .3 Roof covering of buildings
  - .1 The roof covering of buildings on the periphery is part of the system. A wireless detection system must cover these areas.
- .4 Status display
  - .1 The motion detection system must integrate with the management system currently in place.
- .5 Material
  - .1 All interior equipment must:
    - .1 Be designed for rack mounting (no tablet PCs).
  - .2 Any external case must:
    - .1 Be in a locked case or secured with at least 2 security screws;
    - .2 Have tamper detection upon opening the case;
    - .3 Be of metal construction.
- .6 Identification
  - .1 All equipment boxes must:
    - .1 Have a permanently affixed label on the interior and exterior of the unit which identifies the manufacturer, the model or assembly number, the serial number and the power requirement.
- .7 Environment
  - .1 Any outdoor equipment including enclosures, sensors, cables, and mounting equipment must:
    - .1 Be capable of continuous operation;
    - .2 Start and operate from -40 °C to 50 °C;
    - .3 Start and operate from 20% to 90% non-condensing humidity;
    - .4 Meet or exceed IP66 dust and water resistance when mounted (IEC EN60529 – International Electrotechnical Commission Degrees of protection provided by enclosures);
    - .5 Be resistant to damage from lightning strikes;
    - .6 Be UV resistant.
  - .2 All interior equipment must:
    - .1 Be capable of continuous operation;

- .2 Start and operate from 0 °C to 50 °C;
- .3 Start and operate from 20% to 90% non-condensing humidity.
- .8 Interference
  - .1 All electronic must:
    - .1 Be certified compliant with IEC EN55022 or IEC EN 55032 (IEC EN55022 – International Electrotechnical Commission Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement) (IEC EN55032 – International Electrotechnical Commission Electromagnetic compatibility of multimedia equipment – Emission requirements (Replacing IEC EN55022));
    - .2 Be certified compliant with IEC EN 55024 (IEC EN55024 – International Electrotechnical Commission Information technology equipment – Immunity characteristics – Limits and methods of measurement).
- .9 Reliability
  - .1 All components must:
    - .1 Have a Mean Time Between Failures of at least 75,000 hours.
  - .2 All sensor cabling must:
    - .1 Field splice-able without any special tools (only hand tools).
- .10 Security
  - .1 Any external case must:
    - .1 Comply with IEC EN60950-1 or IEC EN60950-22 or CAN / CSA-C22.2 NO. 60950-1. (IEC EN60950-1 - International Electrotechnical Commission Information technology equipment - Safety - Part 1: General requirements, IEC EN60950-22 - International Electrotechnical Commission Information technology equipment - Safety - Part 22: Equipment to be installed at outside).

## **2.2 FENCE DISTURBANCE DETECTION SYSTEM (FDS)**

- .1 The system must:
  - .1 Be designed to operate on an at least 3.6m high, continuous fabric, top and bottom rail chain link fence topped by additional concertina wire;
  - .2 Support a perimeter up to 2000 m.
- .2 Gate sensor.
  - .1 Given that gate movement can lead to unreliable connections due to continual bending of any wired connection, the system must:
    - .1 Be designed to operate on swing and slide type gates.
- .3 Status display.
  - .1 The motion detection system must integrate with the management system currently in place.

- .4 Dimensions.
  - .1 All interior equipment must:
    - .1 Be designed for rack mounting (no adaptation of desk top computers).
  - .2 Any outdoor enclosure must:
    - .1 Be in a locked case or secured with at least 2 security screws;
    - .2 Have tamper detection upon opening the case;
    - .3 Be of metal construction.
- .5 Labeling
  - .1 Any outdoor equipment enclosure must:
    - .1 have a permanently affixed label on the interior and exterior of the unit which identifies the manufacturer, the model or assembly number, the serial number and the power requirement.
- .6 Environment
  - .1 Any outdoor equipment, including enclosures, sensors, cables and mounting equipment, must:
    - .1 Be capable of continuous operation;
    - .2 Start and operate from -40°C to 50°C;
    - .3 Start and operate from 20% to 90% non-condensing humidity;
    - .4 Meet or exceed IP66 dust and water resistance when mounted (IEC EN60529 – International Electrotechnical Commission Degrees of protection provided by enclosures);
    - .5 Be resistant to damage from lightning strikes;
    - .6 Be UV resistant.
  - .2 Any indoor equipment must:
    - .1 Be capable of continuous operation;
    - .2 Start and operate from 0°C to 50°C;
    - .3 Start and operate from 20% to 90% non-condensing humidity.
- .7 Interference
  - .1 All electronics must:
    - .1 Be certified compliant with IEC EN55022 or IEC EN 55032 (IEC EN55022 – International Electrotechnical Commission Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement) (IEC EN55032 – International Electrotechnical Commission Electromagnetic compatibility of multimedia equipment – Emission requirements (Replacing IEC EN55022));
    - .2 Be certified compliant with IEC EN 55024 (IEC EN55024 – International Electrotechnical Commission Information technology equipment – Immunity characteristics – Limits and methods of measurement).

- .8 Reliability
  - .1 All components must:
    - .1 Have a Mean Time Between Failures of at least 75,000 hours.
  - .2 All wiring must:
    - .1 Field splice-able without any special tools (only hand tools).
- .9 Security
  - .1 Any outdoor enclosure must:
    - .1 Meet IEC EN60950-1 or IEC EN60950-22 or CAN/CSA-C22.2 NO. 60950-1. (IEC EN60950-1 – International Electrotechnical Commission Information technology equipment – Safety – Part 1: General requirements, IEC EN60950-22 – International Electrotechnical Commission Information technology equipment – Safety - Part 22: Equipment to be installed outdoors).

### **2.3 WIRELESS DETECTION SYSTEM.**

- .1 The system must:
  - .1 Meet the same technical detection requirements as the motion detection system (MDS).

## **Part 3 EXECUTION**

### **3.1 REQUIREMENTS OF THE CONTRACTOR SPECIALIZED IN INTRUSION**

- .1 The installation of the system must be certified by the manufacturer after the installation.

### **3.2 SUPPLY**

- .1 Provide, install, configure, calibrate and service a buried Motion Detection System (MDS);
- .2 Provide, install, configure, calibrate and service a Fence Detection System (FDS);
- .3 Providing, installing, configuring, calibrating and servicing a temporary detection system, during the replacement of the buried Motion Detection System (MDS). This system must meet the requirements of the buried Motion Detection System and be independent;
- .4 Following the commissioning of the new buried detection system (MDS), dismantle the temporary detection system.

### **3.3 TEST**

- .1 Verification of conditions: Before proceeding with the installation of intrusion detection devices, ensure that the condition of surfaces / supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out in accordance with the written instructions of the manufacturer.
  - .1 Make a visual inspection of the surfaces / supports in the presence of the client's representative;



- .2 Immediately inform the client representative of any unacceptable conditions found;
- .3 Begin installation work only after correcting unacceptable conditions and receiving written approval from the customer representative.

### **3.4 INSTALLATION**

- .1 General installation
  - .1 Install the intrusion detection systems and their components in accordance with the manufacturer's written installation instructions, according to the locations, mounting heights and monitoring areas shown on the revised shop drawings;
  - .2 Securely attach the intrusion detection system and its components to walls, ceilings, and other specified supports;
  - .3 Install required boxes in accessible, non-visible locations
  - .4 Conceals ducts and wiring.
- .2 Specific installation
  - .1 Motion sensor buried
    - .1 The system must be integrated with the main communications and control station with all other intrusion detection systems;
    - .2 Outdoor non-sensor cables must be in a rigid steel conduit or in closed cable trays above the ground and in a PVC conduit for the buried section;
    - .3 Outdoor non-sensor cables located on the fence must be positioned within 10cm of the top rail of the fence;
    - .4 Gate sensors must connect directly to and integrate with the motion sensing system. The below identified perimeter inputs and outputs may be used for this purpose;
    - .5 Gate sensors must be positioned to overlap coverage with the motion sensors to provide continuous sensing on the perimeter;
    - .6 Outer building roof monitoring is part of the system and wireless sensors need to be positioned to overlap the coverage with buried motion detectors to provide continuous perimeter detection.
  - .2 Fence disturbance sensor
    - .1 The system must be integrated with the main communications and control station with all other perimeter intrusion detection systems;
    - .2 Outdoor non-sensor cables must be in a rigid steel conduit or in closed cable trays above the ground and in a PVC conduit for the buried section;
    - .3 Outdoor non-sensor cables located on the fence must be positioned within 10cm of the top rail of the fence;
    - .4 Door sensors must connect directly to and integrate with the Fence disturbance system;
    - .5 The sensor cable must be install on all connection inner perimeter fence with internal fence, for a length of 2,5m;

- .3 Configuration
  - .1 The configuration of the system detection zones should be similar to the currently defined zones;
  - .2 The system must support a password protected configuration user at the console;
  - .3 The configuration user must be able to:
    - .1 Add, modify, and delete perimeter sectors;
    - .2 Initiate system self tests;
  - .4 The configuration of the sector must include:
    - .1 Sector name (minimum twenty (20) characters);
    - .2 Sector extents;
    - .3 Sector in maintenance enable/disable.
  - .5 All configuration changes must be recorded with the date and time, the sector concerned and the user identification.
- .4 Wireless intrusion detector
  - .1 When replacing the buried Motion Detection System, a wireless detection system must be temporarily put into service. Two intrusion detection systems must always be kept functional;
  - .2 Installation of the system must be certified by the manufacturer following installation;
  - .3 The system must be integrated with the main communications and control station with all other intrusion detection systems;
  - .4 Outdoor non-sensor cables must be installed in rigid steel conduit or in closed cable trays above the ground and in a PVC conduit for the buried section;
  - .5 Outdoor non-sensor cables sections that are not sensors located on the fence must be positioned within 10 cm of the top rail of the fence;
  - .6 Door sensors must connect directly to and integrate with the motion detection system;
  - .7 Door sensors must be positioned to overlap the cover with motion sensors to provide continuous detection on the perimeter.

- .3 Outdoor Enclosure
  - .1 Any outdoor enclosure must:
    - .1 Be deployed on the non-inmate side of the fence;
    - .2 Be in a locked case or secure with at least 2 security screws;
    - .3 Certify against solid bodies and against the intrusion of water: IP66.
  - .2 Have a tamper detection contact when opening the case;
  - .3 Be of metal construction.

### **3.5 OPERATION**

- .1 Motion Detection System buried
  - .1 Test and calibration
    - .1 The system must:
      - .1 Be configurable and modifiable from a console compatible with: monitor, keyboard, multiport KVM in the common equipment room (CER)
      - .2 Include a manual tool for providing a consistent input for fence sensitivity calibration and testing;
      - .3 Be able to perform a full system self test on demand.
    - .2 Redundancy
      - .1 The system must lose detection and reporting of no more than one perimeter sector in the presence of any single system cable (non-sensor or sensor) cut, short circuit, or disconnection on the perimeter or connecting to the perimeter.
    - .3 Alarms
      - .1 The system must:
        - .1 retain its configuration over a power cycle;
        - .2 not generate spurious alarms on start-up;
        - .3 resume normal operation without operator intervention;
      - .2 Alarms must be reported within one second;
      - .3 The system must detect the following events on the sensor cable:
        - 1. Cuts;
        - 2. Short circuits;
        - 3. Disconnections.
      - .4 The locations of sensor cable faults must be reported within 10 m of the fault;

- .5 The system must:
    - 1. report a tamper alarm upon opening any outdoor enclosure;
    - 2. report an alarm upon power loss at any outdoor enclosure.
    - 3. detect with a minimum Pd of 95% with a confidence of 99% a person of at least 35kg moving in the detection zone between 0.05 m/s and 8 m/s;
    - 4. reject with a maximum Pd of 5% with a confidence of 90% an animal of at most 10kg moving in the detection zone;
    - 5. locate the crossing point to within 10m of the actual location;
    - 6. identify and report multiple crossing points if separated by more than 10m.
  - .6 The system must identify any faults in the self-tests.
- .2 Fence disturbance detection and wireless intrusion detection (wireless).
- .1 Test and calibration.
    - .1 The system must:
      - .1 Be configurable and modifiable from a console compatible with: monitor, keyboard, multiport KVM in the common equipment room (CER)
      - .2 Include a manual tool for providing a consistent input for fence sensitivity calibration and testing;
      - .3 Be able to perform a full system self test on demand.
      - .4 Display be able to display all console text in French and English.
    - .2 Status Reporting.
      - .1 The system must:
        - .1 Accept a sector status message on request;
        - .2 Provide a sector status result message upon request;
        - .3 Provide an alarm message upon detecting an alarm state;
        - .4 Provide an alarm clear message upon removing an alarm state;
        - .5 Provide a fault message upon removing a system failure fault;
        - .6 Accept a system self-test message;
        - .7 Provide a self-test results message.
    - .3 System redundancy
      - .1 The system must lose detection and reporting of no more than one perimeter sector in the presence of any single system cable (sensor, non-sensor, or power) cut, short circuit, or disconnection on the perimeter or connecting to the perimeter.

- .2 The system must lose detection and reporting of no more than two perimeter sectors in the presence of any single piece of perimeter mounted equipment failing.
- .4 System capacity
  - .1 The system must be able to store at least:
    - .1 Three thousand (3,000) alarms;
    - .2 Ten thousand (10,000) sector edits and faults.
- .5 Alarms
  - .1 The system must:
    - .1 retain its configuration over a power cycle;
    - .2 not generate spurious alarms on start-up;
    - .3 resume normal operation without operator intervention.
  - .2 Alarms must be reported within one second of detection;
  - .3 Sensor processing must detect and alarm for sensor cable:
    - .1 Cuts;
    - .2 Short-circuits;
    - .3 Disconnections.
  - .4 Sensor cable fault locations must be reported to within 10m of the fault.
  - .5 The system must report a tamper alarm upon opening any outdoor enclosure.
  - .6 The system must report an alarm upon power loss at any outdoor enclosure.
  - .7 The system must detect with a minimum Pd of 95% with a confidence of 95%:
    - .1 Cutting the fence fabric;
    - .2 Lifting the fence fabric;
    - .3 Climbing of the fence by a person of at least 45kg;
  - .8 The system must locate the cutting/lifting/climbing point to within 10m of the actual location;
  - .9 The system must report any self-test faults.
  - .10 The installed system must support “masking” of detection sectors to disable reporting of sector alarms. This may be implemented in the fence disturbance detection system or in the perimeter intrusion detection system

- .3 Interface
  - .1 System power
    - .1 Any powered indoor components not using DC power inputs must:
      - .1 Accept power from a 120 Vac circuit;
      - .2 Not require more than 15 A during start-up and operation.
    - .2 The system must:
      - .1 be connected to a circuit supplied by the institution's backup generator;
      - .2 be connected to an Uninterruptable Power Supply (UPS) that can maintain system operation for at least sixty minutes – provision of a new UPS or available capacity on an existing UPS will be defined in the request for proposal;
      - .3 be configured to shut down when the UPS is operating from batteries and a low battery signal is output by the UPS.
  - .2 Perimeter Power.
    - .1 All power provided to any perimeter enclosures must be less than 50VDC.
  - .3 Perimeter Inputs.
    - .1 All perimeter equipment enclosures must be able to accept and report at least 2 alarm contact inputs.
  - .4 Perimeter Outputs.
    - .1 All perimeter enclosures must be able to source at least 2 watts of power at 24VDC for external systems.
  - .5 Central Processor.
    - .1 The system's central processor must:
      - .1 connect using an RJ-45 connector;
      - .2 interface over IPV4 Transmission Control Protocol/Internet Protocol (TCP/IP);
      - .3 be able to operate on IEEE 802.3u 100Base-TX (Institute of Electrical and Electronics Engineers IEEE 802.3u – IEEE Standards for Local and Metropolitan Area Networks: Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T);
      - .4 Be synchronized with a network timing protocol server where available (NTP server).

- .6 Logging
  - .1 The system must log to a central logging system:
    - .1 all alarms, errors, and warnings;
    - .2 all status changes;
    - .3 all configuration changes.
  - .2 The system must:
    - .1 retain any logging outputs while disconnected from the central logging system for up to 1000 messages;
    - .2 forward retained logging outputs upon reconnection to the central logging system.
  - .3 All log messages should:
    - .1 Be in a human readable form (extended 8-bit ASCII to support French);
    - .2 As a minimum include the system, event, location, and timestamp to the nearest second;
    - .3 Be comma separated data alternating field title and field data (e.g. "SYSTEM,Fence Detection,EVENT,Alarm,LOCATION,Sector 3 at 42m,TIME,2016/03/22 15:03:44");
  - .4 All logged data retained outside the central logging system must be deleted within one month of being two years old.
- .7 Software development kit.
  - .1 The system must include a software development kit to allow third party integration of all:
    - .1 Alarms;
    - .2 Warnings;
    - .3 Errors;
    - .4 Commands;
    - .5 Status requests.
- .4 On-site testing and inspections
  - .1 Perform inspections and tests in the presence of the Client Representative.
    - .1 Provide the tools and any equipment needed;
    - .2 Ensure that subcontractors and security experts are present at the time of the audit.
  - .2 Visual control:
    - 1. Control to assess the quality of the installation and assembly as well as the overall appearance of the equipment, to ensure that the system is in compliance with the contract documents, and to address the following points:

- .1 Robustness of hardware fixations;
  - .2 No damage due to installation;
  - .3 Device Location Compliance with Revised Shop Drawings;
  - .4 Compatibility of the installation of the equipment with the physical environment;
  - .5 Supply of all accessories;
  - .6 Device identification and wiring identification;
  - .7 Install decals at appropriate locations indicating ULC approval.
- .3 Technical control:
- .1 Control to verify that all systems and devices are properly installed, free of defects and damage, and should address the following points.
    - .1 Measurement of the space covered by the detection devices;
    - .2 Junctions / connections and hardware fixings;
    - .3 Compliance with manufacturer's specifications, documentation, and installation instructions.
  - .4 Operational control:
    - .1 Control to ensure that the performance of devices and systems meets or exceeds established functional requirements and should address the following issues.
      - .1 Operation of each device, individually and in its environment;
      - .2 Operation of each device according to a programmable schedule and / or with specific functions.
- .5 Setting
- .1 Set all components to work properly.
- .6 Protection
- .1 Protect installed equipment and components from damage during construction;
  - .2 Repair damage to adjacent materials and equipment by installing the intrusion detection system.

**END OF SECTION**



**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 33.01 – *Excavating, trenching and backfilling.*

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM).
  - .1 ASTM C 127-15, Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
  - .2 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .3 ASTM D 1557-12e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - .4 ASTM D 4253-16, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

**1.3 DEFINITIONS**

- .1 Corrected maximum dry density is defined as:
  - .1  $D = (F1 \times D1) + (0.9 \times D2 \times F2)$ .
  - .2 Where: D = corrected maximum dry density kg/m<sup>3</sup>.
    - .1 F1 = fraction (decimal) of total field sample passing 4.75 mm sieve.
    - .2 F2 = fraction (decimal) of total field sample retained on 4.75 mm sieve (equal to 1.00 - F1).
    - .3 D1 = maximum dry density, kg/m<sup>3</sup> of material passing 4.75 mm sieve determined in accordance with Method A of ASTM D 1557.
    - .4 D2 = bulk density, kg/m<sup>3</sup>, of material retained on 4.75 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C 127.
  - .3 For free draining aggregates, determine D1 (maximum dry density) to ASTM D 4253.

**Part 2 PRODUCTS****2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION****3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 33.01 – *Excavating, trenching and backfilling.*

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials (ASTM).
  - .1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

**1.3 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 - *Submittal Procedures.*
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Route unused aggregates to a local quarry approved by the Departmental Representative.

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Natural sand.
  - .2 Artificial sand.
  - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
  - .3 Light weight aggregate, including slag and expanded shale.

## **2.2 SOURCE QUALITY CONTROL**

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

## **Part 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Aggregate source preparation.
  - .1 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
  - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified. Use methods and equipment approved in writing by Departmental Representative.
  - .3 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements. Use only equipment approved in writing by Departmental Representative.
  - .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
- .2 Processing.
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .3 Stockpiling.
  - .1 Aggregates must be put in place as work progresses. No sites will be available for stockpiling. Therefore, stockpiling of all materials is forbidden on the construction site.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 34 – *Conduits, conduit fastenings and conduit fittings*
- .2 Section 28 23 00 – *Video surveillance;*
- .3 Section 28 31 00 – *Intrusion detection.*
- .4 Section 31 05 10 – *Corrected maximum dry density for fill*
- .5 Section 31 32 19.16 – *Geotextile soil stabilization*
- .6 Section 33 65 73 – *Concrete encased duct banks and manholes*

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 117-17, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 422-63(2007) e2, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D 1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D 4318-17, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Office des normes générales du Canada (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Association canadienne de normalisation (CSA)/CSA International
  - .1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

**1.3 DEFINITIONS**

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: solid material in excess of 1 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.2.
    - .2 Table
 

Sieve designation	% passing
2 mm	100
0,10 mm	45-100
0,02 mm	10-80
0,005 mm	0-45
    - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

- .9 Soils that meet applicable CCME guidelines: refers to soils with contaminant concentrations that are less than or equal to Canadian environmental quality guidelines
- .10 Applicable Guidelines for Soil Quality: Environment and Human Health for Residential / Park Use by the Canadian Council of Ministers of the Environment

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Quality Control: in accordance with Section 01 45 00 - *Quality Control*.
  - .1 Submit for review by Departmental Representative proposed dewatering of trenches methods as described in PART 3 of this Section.
  - .2 Submit for review by Departmental Representative proposed dewatering of saturated stockpiles methods as described in PART 3 of this section.
  - .3 Submit to the Departmental Representative, for review, methods for erosion control, including the characteristics and dimensions of the works and the means provided for the rehabilitation of ditches affected by any debris or deposits. in accordance with PART 3 of this section.
  - .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
  - .5 Submit to Departmental Representative testing and inspection results and report as described in PART 3 of this section.
- .3 Samples
  - .1 Submit samples in accordance with Section 01 33 00 - *Submittal Procedures*.
  - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

#### **1.5 QUALITY CONTROL**

- .1 Provide the services of a qualified engineer qualified or licensed to practice in Canada, in the province where the work will be performed, to design and inspect the retaining, bracing and underpinning structures. used during the execution of the works.
- .2 Health and safety
  - .1 Take the necessary health and safety measures in accordance with Section 01 35 29.06 - *Health and Safety requirements*.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*.

#### **1.7 EXISTING CONDITIONS**

- .1 Buried services
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

- .3 Confirm locations of buried utilities by careful test excavations.
- .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .5 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing buildings and surface features
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires and pavement which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

## Part 2 PRODUCTS

### 2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - *Aggregate for earthwork* and the following requirements.
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117 . Sieve sizes to CAN/CGSB-8.2.
  - .3 Table

Sieve designation	% passing Type 1 (MG 20)	% passing Type 2 (MG 112)
<b>112 mm</b>	s.o.	100
<b>80 mm</b>	s.o.	s.o.
<b>56 mm</b>	s.o.	s.o.
<b>40 mm</b>	s.o.	s.o.
<b>31,5 mm</b>	100	s.o.
<b>20 mm</b>	90-100	s.o.
<b>14 mm</b>	68-93	s.o.
<b>5 mm</b>	35-60	12-100
<b>1,25 mm</b>	15-38	s.o.
<b>315 µm</b>	5-17	s.o.
<b>80 µm</b>	2-7	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Filter material: Crushed stone 19 mm in diameter, clean, hard and durable, free of dust, foreign matter, organic or vegetal matter and flat or elongated fragments.

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**Part 3 EXECUTION**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, Methods of work must also include the means provided for the rehabilitation of ditches affected by any debris or soil deposits. These means must comply with the requirements of the competent authorities.
- .2 Set up temporary means to control erosion and sediment deposition, in accordance with the requirements of the competent authorities.
- .3 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 PREPARATION/ PROTECTION**

- .1 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .4 Protect buried services that are required to remain undisturbed.

**3.3 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of grasses and removed from site.
- .2 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil off site.

**3.4 STOCKPILING**

- .1 Stockpile fill materials at locations designated by the Departmental Representative in separate piles as described below:
  - .1 Stockpile excavated soils saturated with water so that they drain and can be used for backfilling.
  - .2 Stockpile unsaturated excavated soils and protect them to prevent saturation and migration of sludge or suspended solids.
  - .3 Stockpile granular materials in a manner that prevents segregation.
- .2 Protect fill materials from contamination using polyethylene membranes according to the requirements of the competent authorities.



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

### **3.5 TEMPORARY SHORING**

- .1 Submit to the Departmental Representative, for review and authentication, details of proposed methods for temporary shoring works during excavation.
- .2 Construct temporary shoring works as approved by Departmental Representative.
- .3 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - *Health and Safety requirements* and Health and Safety Act for the Province of Quebec.

### **3.6 DEWATERING**

- .1 Keep excavations free of water while Work is in progress. See the geotechnical study in Appendix 1 to see the water table near the surface in some places.
- .2 Provide for Departmental Representative approval details of proposed dewatering methods.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 The Contractor must take all necessary precautions to prevent the lifting of any structure, including underground pipes or pipelines, during dewatering works.
- .5 The water discharged during the drying of the excavations must be analyzed and treated if necessary, before being rejected in order to meet the environmental criteria in force.
- .6 Dispose of water in accordance with Section 01 35 43 - *Environmental Procedures* to approved runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.

### **3.7 EXCAVATION**

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Excavation must not interfere with bearing capacity of adjacent foundations.
- .3 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 50 m of trench in advance of installation operations and do not leave open more than 50 m at end of day's operation.
- .4 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of surplus and unsuitable excavated material as shown on plan R\_088111\_001-C-03-PN-CLO. The use of this deposit is approved for the disposal of waste without prior characterization. However, if it turns out that during excavations, the excavated soils contain a significant amount of debris, visual or olfactory signs of contamination, these soils must be set aside for possible characterization. At the end of the work, a sketch of the disposal site identifying where the waste is deposited if it is in a specific and remarkable place must be provided to the Departmental Representative.
- .7 Do not obstruct flow of surface drainage or natural watercourses.

- .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .9 Notify Departmental Representative when bottom of excavation is reached.
- .10 Obtain Departmental Representative approval of completed excavation.
- .11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .12 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .13 Install geotextiles in accordance with Section 31 32 19.16 - *Geotextile soil stabilization*.
- .14 Install steel plates over the trench to allow access to vehicular entrances at all times.

### **3.8 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698 and ASTM D 1557 in accordance with Section 31 05 10 - *Corrected Maximum Dry Density for Fill*.
- .2 Backfill materials must comply with applicable CCME recommendations. The Contractor must provide analytical certificates indicating that backfill soil meets applicable CCME recommendations

### **3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.10 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Removal of concrete formwork.
  - .3 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations
- .6 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
- .7 Place layers simultaneously on both sides of installed Work to equalize loading.

### **3.11 REHABILITATION**

- .1 Upon completion, remove waste materials and debris in accordance with Section 01 74 19 - *Waste Management and Disposal*, grade slopes and correct defects as directed by the Departmental Representative.
- .2 Replace topsoil as directed by Departmental Representative.
- .3 Clean and repair areas affected by works, including material deposit areas, as directed by the Departmental Representative.
- .4 Protect newly graded areas from erosion, prevent traffic and keep them free of waste or debris.

### **3.12 VIDEO SURVEILLANCE AND INTRUSION DETECTION SYSTEMS**

- .1 Excavations and trenches dedicated to video surveillance and intrusion detection systems are shown roughly in plans. The design of these systems is not final and will be performed in situ at the time of construction by the Departmental Representative. The Contractor must coordinate with the disciplines involved and provide the necessary excavations and trenches for a complete, functional and safe installation. The quantities of excavation and trench indicated in the slip, in linear meters, are approximate. They will be adjusted for payment purposes according to the quantities realized.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 33.01 – *Excavating, trenching and backfilling.*

**1.2 REFERENCE STANDARDS**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-4.2 No 11.2-M89 (R2013), Textile Test Methods Bursting Strength - Ball Burst Test.
  - .2 CAN/CGSB-148.1, Methods of Testing Geosynthetics (Complete).
    - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
    - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
    - .3 No.4-94, Methods of Testing Geosynthetics Geotextiles - Normal Water Permeability Under No Compressive Load.
    - .4 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
    - .5 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
    - .6 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit to Departmental Representative copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00 - *Submittal Procedures.*

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – *Waste management and disposal.*

**Part 2 PRODUCTS****2.1 MATERIAL**

- .1 Geotextile: woven or non-woven synthetic fibre fabric, supplied in rolls.
  - .1 Width: 3,5 m minimum.
  - .2 Composed of: minimum 85% by mass of polypropylene.
- .2 Physical properties

- .1 Tensile strength and elongation according to the pull-out test: in accordance with CAN / CGSB-148.1, number 7.3.
  - .1 Rupture strength: at least 800 N when wet.
  - .2 Elongation at break: 45% to 105%.
- .2 Bursting strength according to the ball burst test: at least 2275 N in a wet state, in accordance with CAN / CGSB-4.2, number 11.2.
- .3 Hydraulic properties
  - .1 Filtration openings (hydrodynamic sieving): 150 µm, according to CAN / CGSB-148.1, number 10.
  - .2 Permittivity: 0.96 per second, according to CAN / CGSB-148.1, Number 4.
- .4 Thread for sewn joints: having resistance to chemical and biological agents equal to or greater than that of geotextile.

### **Part 3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 Cover the specified materials with the geotextile within 4 hours of placing it.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .8 Set up and compact backfill layers in accordance with Section 31 23 33.01 - *Excavating, Trenching and Backfilling*.

#### **3.2 CLEANING**

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

#### **3.3 PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 31 05 16 – *Aggregates for earthwork*

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C 117-17, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 131/ C 131 M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C 136/ C 136 M -14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D 1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D 1883-16, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D 4318-17, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sort and recycle waste in accordance with Section 01 74 19 - *Waste Management and Disposal*.
- .2 Route unused aggregates to an approved local treatment facility as directed by the Departmental Representative.

**Part 2 PRODUCTS****2.1 MATERIALS**

- .1 Granular sub-base material: in accordance with Section 31 05 16 - *Aggregate for earthwork* and following requirements:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to specified requirements:

## .3 Table

Sieve designation	% passing
31.5 mm	100
20 mm	90-100
14 mm	68-93
5 mm	35-60
1.25 mm	15-38
315 µm	5-17
80 µm	2-7

## .4 Other properties as follows

- .1 Liquid Limit: to ASTM D 4318, Maximum 25.
- .2 Plasticity Index: to ASTM D 4318, Maximum 6.
- .3 Los Angeles degradation: to ASTM C 131. Maximum loss by mass: 50 %

**Part 3 EXECUTION****3.1 PLACING**

- .1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 300 mm compacted thickness Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.

**3.2 COMPACTION**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 98% corrected maximum dry density in accordance with ASTM D 1557.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.3 TOLERANCES**

- .1 The permissible deviation of the finished foundation layer is 10 mm more or less than the prescribed level; this difference, in more or less, can not however be uniform over the entire surface of the foundation layer.

### **3.4 PROTECTION**

- .1 Maintain the finished foundation layer in accordance with the requirements of this section until the next layer is completed or the Departmental Representative receives the work.

**END OF SECTION**



**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 32 12 16 – *Asphalt paving*.

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 140/D 140 M-16, Standard Practice for Sampling Asphalt Materials.
  - .2 ASTM D 2397/D 2397 M-17, Standard Specification for Cationic Emulsified Asphalt.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - *Submittal Procedures*.
- .2 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work to ASTM D 140.

**1.4 QUALITY ASSURANCE**

- .1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with ASTM D 140.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 - *Waste Management and Disposal*, and with the Waste Reduction Workplan.
- .2 Route unused asphalt materials to an appropriate recycling facility.

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Fast-emulsion cationic bituminous emulsion: in accordance with ASTM D 2397 / D 2397 M, class: CRS-1 or CRS-1h.
- .2 Water: clean, drinkable, free from foreign matter.

**2.2 EQUIPMENT**

- .1 Pressure distributor:
  - .1 Designed, equipped, maintained and operated so that asphalt material can be:
    - .1 Maintained at even temperature;
    - .2 Applied uniformly on variable widths of surface up to 5 m;
    - .3 Applied at readily determined and controlled rates from 0.2 to 5.4 L/m<sup>2</sup> with uniform pressure, and with allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>;

- .4 Distribute in uniform spray without atomization at temperature required.
- .2 Equipped with meter, registering travel in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
- .3 Equipped with pump having flow metre graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
- .4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
- .5 Equipped with accurate volume measuring device or calibrated tank.
- .6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
- .7 Equipped with nozzle spray bar, with operational height adjustment capable of being raised or lowered.
- .8 Cleaned if previously used with incompatible asphalt material.

### **Part 3 EXECUTION**

#### **3.1 APPLICATION**

- .1 Proceed with installation only after receipt of written approval to proceed from Departmental Representative.
- .2 Apply asphalt tack coat only on clean and dry surface.
- .3 Apply asphalt tack coats evenly to the surface to be coated at the following residual rates:
  - .1 On a new asphalt: 0,20 L/m<sup>2</sup>
  - .2 On an existing asphalt: 0,25 L/m<sup>2</sup>
  - .3 On a milled asphalt: 0,30 L/m<sup>2</sup>
- .4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.
- .5 Apply asphalt tack coat only when rain is not forecast within the next hours.
- .6 Apply asphalt tack coat only on unfrozen surface.
- .7 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.
- .8 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
- .9 Keep traffic off tacked areas until asphalt tack coat has set.
- .10 Re-tack contaminated, or disturbed areas as directed by Departmental Representative.
- .11 Permit asphalt tack coat to set before placing asphalt pavement.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 32 11 16.01 – *Granular sub-base*
- .2 Section 32 12 13.16 – *Asphalt tack coats*

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .2 Standards Council of Canada (CSA)/CSA International.
    - .1 CAN/CGSB-1.5-M91, Low Flash Petroleum Spirits Thinner.
    - .2 CAN/CGSB-1.74-2001, Alkyd traffic paint.
  - .3 Government of Quebec, Quebec Ministry of Transport.
    - .1 CCDG-2018.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sort and recycle waste in accordance with Section 01 74 19 - *Waste Management and Disposal*.
- .2 Remove all packaging materials from site and forward to appropriate recycling facilities.
- .3 Route unused aggregates to the quarry or recycling facility approved by the Departmental Representative.
- .4 Transport unused paint products and paint thinners to an approved hazardous materials collection site approved by the Departmental Representative.
- .5 It is prohibited to dump unused paint and paint thinner into sewer, watercourse, lake, ground, or any other place where it could pose a health or safety hazard.
- .6 Route unused asphalt materials to an appropriate recycling facility.

**Part 2 PRODUCTS****2.1 MATERIALS**

- .1 Aggregates: in accordance with CCDG.
  - .1 Crushed aggregates MG 20 et MG 56.
- .2 Asphaltic concrete: in accordance with CCDG.
- .3 Road marking paint: yellow and white, in accordance with CAN / CGSB-1.74.
- .4 Paint thinner: CAN / CGSB-1.5 compliant.

**Part 3 EXECUTION**

**3.1 BASE COURSE**

- .1 Each layer of granular material shall be not more than 300 mm thick after compacting to 100% of maximum density in accordance with ASTM D 698.

**3.2 THICKNESS OF PAVING**

- .1 Paving
  - .1 Base course: ESG-14 mix, PG 58-28, 70 mm thick.
  - .2 Surface course: ESG-10 mix, PG 58-28, 60 mm thick.

**3.3 PLACING OF PAVING**

- .1 Preparation of the surface of the coating: according to the CCDG.
- .2 Application of the tack coat: according to the CCDG.
- .3 Realization of bituminous concrete surfacing: according to the CCDG.

**3.4 PAVEMENT MARKING**

- .1 Carry out pavement markings in accordance with the manufacturer's recommendations and as indicated.
- .2 Use paint thinner according to manufacturer's recommendations.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00 – *Cast in place concrete.*
- .2 Section 26 05 28 – *Grounding secondary.*

**1.2 REFERENCE**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A 53/A 53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A 90/A 90M-13 (2018), Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - .3 ASTM A 121-13(2017), Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
  - .4 ASTM A653/A653M-18, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
  - .2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.
  - .3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.
  - .4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.
  - .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA Group (CSA)/CSA International.
  - .1 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33).
- .5 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
  - .1 Safety data sheets (SDSs).
- .6 The Master Painters Institute (MPI) - Architectural Painting Specification Manual – (2014).
  - .1 MPI # 18, Organic Zinc Rich Primer.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - *Submittal Procedures.*
- .2 Shop drawings must show or indicate the following:
  - .1 Corner, line and straining posts.
  - .2 Chain link fence fabric for fences and barriers.

- .3 Bottom and top rails, tension bars, tension bar bands, post, tie wires and all other necessary accessories.
- .4 Barbed wire, barbed tape concertinas, steel arm posts.
- .5 Motorized sliding barriers, including control device, motor, self-closing device, security barriers.
- .6 Manual sliding barrier, including closing device.
- .7 Manual single swing gate for pedestrians, including closing device, hinges and locking system.
- .8 Manual double swing gate for pedestrians, including closing device, hinges and locking system.
- .9 Vehicular manual double swing gate, including closing device, hinges and locking system.

#### **1.4 HEALTH AND SAFETY**

- .1 Respect the professional health and safety rules and regulations in construction according to section 01 35 29.06 – *Health and safety*.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Do not store materials directly on the ground to keep it dry and clean.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sort the waste for reuse and recycling in accordance with section 01 74 19 – *Waste management and disposal*.
- .2 Remove all packaging materials from site and forward to appropriate recycling facilities.
- .3 Unused paint and coatings must be directed to an approved hazardous materials collection site approved by Departmental Representative.
- .4 Fold metal strapping, flatten and place in designated areas for recycling.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Concrete mixes and concrete materials for sonotubes: in accordance with Section 03 30 00 - *Cast-in-place concrete*.
- .2 Chain link fence fabric: according to CAN / CGSB-138.1.
  - .1 Type 1, Class A, (zinc-Coated galvanized after weaving, hot dipped galvanized), minimal diameter of wire: 4,8 mm.
  - .2 Mesh size: 50,8 mm
  - .3 Height of fence fabric: 3,6 m.
  - .4 The average zinc coating weight shall not be less than 610 g / m<sup>2</sup> of uncoated wire.
  - .5 Minimum tensile strength: 10 000 N.

- .3 Posts, rails and bracing: galvanized steel pipes, according to CAN / CGSB-138.2, type 2 (minimal elastic limit of 344 MPa), dimensions shown on plans.
  - .1 Corner post: outside diameter of 168,3 mm, linear density 28,2 kg/m.
  - .2 Straining post: outside diameter of 114,3 mm, linear density 15,9 kg/m.
  - .3 Line post: outside diameter of 73 mm, linear density 8,6 kg/m.
  - .4 Bottom and top rails: outside diameter of 42,2 mm, linear density 3,4 kg/m.
  - .5 Bracing: outside diameter of 42,2 mm, linear density 3,4 kg/m.
- .4 Tie wires: 3.7 mm (9 gauge) galvanized steel.
- .5 Tension bars: Galvanized steel, according to ASTM A 653 / A 653M, at least 5 mm x 20 mm for a height of 3600 mm.
- .6 Barriers: in accordance with CAN / CGSB-138.4.
- .7 Barrier frame: in accordance with Section 08 42 29 – *Automatic entrances*.
- .8 Assembly and hardware parts in accordance with CAN / CGSB-138.2, galvanized steel.
  - .1 Galvanized steel tension bar band, minimum 3 mm x 20 mm.
  - .2 Galvanized steel post caps for water tightness, securely fastened to posts and carrying the top rail.
  - .3 Watertight overhead connections to secure top rails and post arms to support barbed wire.
  - .4 Post arms measuring 625 mm in length at a 45-degree angle from horizontal with fasteners or niches 450 mm apart to maintain 2 rows of barbed wire.
  - .5 Turnbuckles to be drop forged.
- .9 Zinc Rich Organic Coating: to CAN / CGSB-1.181.
- .10 2,5 mm diameter barbed wire made of galvanized zinc-coated steel in accordance to CAN / CGSB-138.2, with 4 tips every 150 mm.
- .11 Barbed tape consisting of 20 mm x 0.5 mm galvanized steel tape clenched around a galvanized spring steel core wire 2.5 mm in diameter to form a 710 mm nominal diameter concertina coil. When installed, the diameter of the coil stretched should be 630 mm and the space between the loops should not exceed 230 mm. Blades should be 20 mm from one end to the other and the barbed wire should be spaced approximately 45 mm from center to center.
- .12 Grounding Pins: in accordance with Section 26 05 28 – *Grounding secondary*.

## 2.2 FINISHES

- .1 Galvanizing
  - .1 For chain link fabric: to CAN/CGSB-138.1.
  - .2 For pipe: 610 g/m<sup>2</sup> minimum to ASTM A 90.
  - .3 For barbed wire: to CAN/CGSB-138.2.
  - .4 For other fittings: to ASTM A 123/A 123M.

**Part 3 EXECUTION****3.1 GRADING**

- .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
  - .1 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

**3.2 ERECTION OF FENCE**

- .1 Erect fence along lines as indicated and to CAN/CGSB-138.3.
- .2 For the posts, dig holes 1,5 times the diameter of the sonotube to install, as requested in the plans. The sonotubes must be raised by 300 mm when pouring the concrete for the post bases.
- .3 Space line posts 2,5 m apart, measured parallel to ground surface.
- .4 Space straining posts at equal intervals not to exceed 30 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 30 m.
- .5 Install additional straining posts at sharp changes in grade and where directed by Departmental Representative.
- .6 Install corner post where change in alignment is 45 degrees.
- .7 Install end posts at end of fence and at buildings.
  - .1 Install gate posts on both sides of gate openings.
- .8 Place concrete in post holes then embed posts into concrete to depths indicated.
  - .1 Extend concrete at ground level and slope to drain away from posts.
  - .2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
- .9 Install fence fabric after concrete has cured, minimum of 5 days.
- .10 Install brace between end and gate posts and nearest line post, at inclination as indicated.
  - .1 Install braces on both sides of corner and straining posts in similar manner.
- .11 Install overhang tops and caps.
- .12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.
- .13 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.
  - .1 Knuckled selvedge at bottom;
  - .2 Twisted selvedge at top.
- .14 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.
  - .1 Give tie wires minimum two twists.



- .15 Once the fence fabric has been installed, the tension must be checked by tensile tests. When a 12 kg pull is applied perpendicular to the middle of the fence fabric panel (between rails and posts), the fence must not move more than 30 mm from its resting position.
- .16 Install barbed wire strands and clip securely to lugs of each projection.
- .17 Lay the barbed tape concertina, fixed on the straight barbed wire, to obtain a loop diameter of 630 mm once installed.
- .18 Install grounding rods as indicated.

### **3.3 INSTALLATION OF GATES**

- .1 Install gates in locations as indicated on plans and to section 08 42 29 – *Automatic entrances*.
- .2 Level the ground between the barrier posts and place the lower end of the barrier about 50 mm from the ground.

### **3.4 TOUCH-UP**

- .1 Clean damaged surfaces with a wire brush to remove loose or cracked coating layers. Apply two layers of zinc rich organic paint to damaged surfaces.
  - .1 Before painting damaged surfaces, treat them in accordance with the manufacturer's instructions for applying zinc-rich paint.

### **3.5 CLEANING**

- .1 Clean and treat areas where soil has been disturbed during construction.
  - .1 Dispose of surplus materials as directed by the Departmental Representative.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 32 92 23 - *Sodding*

**1.2 REFERENCE STANDARDS**

- .1 Agriculture and Agri-Food Canada
  - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
  - .1 PN1340, Guidelines for Compost Quality.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3 DEFINITIONS**

- .1 Compost
  - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
  - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
  - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth and contain no toxic or growth inhibiting contaminants.
  - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.5 QUALITY ASSURANCE**

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

- .2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

## **Part 2 PRODUCTS**

### **2.1 TOPSOIL**

- .1 Topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
  - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10% organic matter by weight.
  - .2 Contain no toxic elements or growth inhibiting materials.
  - .3 Finished surface free from:
    - .1 Debris and stones over 50 mm diameter;
    - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .4 Consistence: friable when moist.

### **2.2 SOIL AMENDMENTS**

- .1 Fertilizer:
  - .1 Fertility: major soil nutrients present in following amounts.
  - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
  - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
  - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
  - .5 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
  - .6 Ph value: 6.5 to 8.0.
- .2 Peat moss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous, brown in colour.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to course textured.
- .4 Limestone:
  - .1 Ground agricultural limestone.
  - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .5 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

**2.3 SOURCE QUALITY CONTROL**

- .1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
- .5 Soil sampling, testing and analysis to be in accordance with Provincial standards.

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

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

**3.2 PREPARATION OF EXISTING GRADE**

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

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

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

**3.4 FINISH GRADING**

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

**3.5 ACCEPTANCE**

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

**3.6 SURPLUS MATERIAL**

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

**3.7 CLEANING**

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

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 32 91 19.13 – *Topsoil placement and grading.*

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 SCHEDULE OF WORK**

- .1 Establish the schedule for laying sod turf so that it coincides with the preparation of the surfaces.
- .2 Establish the schedule so that the sod is laid once the ground has thawed.
- .3 Pre-Installation Meeting: Hold a meeting to review the work requirements, implementation instructions and terms of the warranty.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Send unused amendment (fertilizer) products to an approved hazardous material collection site approved by the Departmental Representative.
- .2 Disposal of unused fertilizer (fertilizer) in sewers, waterways, lakes, on the ground, or any other place where it may pose a health hazard or risk to any person is prohibited. environment.

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
  - .1 Turf Grass Nursery Sod types:
    - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
  - .2 Turf Grass Nursery Sod quality:

- .1 Not more than 2 broadleaves weed and up to 1% native grasses per 40 square metres.
  - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
  - .3 Mowing height limit: 35 to 65 mm.
  - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Sod establishment support:
    - .1 Wooden pegs: 19 x 19 x 300 mm.
  - .3 Water:
    - .1 Supplied by Contractor.
  - .4 Fertilizer:
    - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.

## 2.2 SOURCE QUALITY CONTROL

- .1 Obtain written approval from Departmental Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

## Part 3 EXECUTION

### 3.1 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - *Topsoil Placement and Grading*. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

### 3.2 SOD PLACEMENT

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.
- .2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

### **3.3 SOD PLACEMENT ON SLOPES AND PEGGING**

- .1 Start laying sod at bottom of slopes.
- .2 Peg sod on slopes steeper than 3 horizontal to 1 vertical, to following pattern:
  - .1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.
  - .2 Not less than 3-6 pegs per square metre.
  - .3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Departmental Representative.
  - .4 Drive pegs to 20 mm above soil surface of sod sections.

### **3.4 FERTILIZING PROGRAM**

- .1 Fertilize during establishment and warranty periods to manufacturer's instructions.

### **3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of installation until acceptance.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
- .3 Cut grass to 50 mm when or prior to it reaching height of 75 mm and maintain sodded areas weed free as directed by Departmental Representative.
- .4 Maintain sodded areas weed free.
- .5 Fertilize areas in accordance with fertilizing program.

### **3.6 ACCEPTANCE**

- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative:
  - .1 Sodded areas are properly established;
  - .2 Sod is free of bare and dead spots;
  - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm;
  - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

### **3.7 MAINTENANCE DURING WARRANTY PERIOD**

- .1 Perform following operations from time of acceptance until end of warranty period.
  - .1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
- .2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.
- .3 Cut grass and remove clippings that will smother grass as directed by Departmental Representative to height as follows.



- .1 Turf Grass Nursery Sod :
  - .1 50 mm during normal growing conditions.
  - .2 Cut grass as directed by Departmental Representative, but at intervals so that approximately one third of growth is removed in single cut.
  - .3 Fertilize areas in accordance with fertilizing program.
  - .4 Eliminate weeds by mechanical or chemical means to extent acceptable to Departmental Representative.

### **3.8 CLEANING**

- .1 Once the work is complete, remove surplus materials, waste materials, tools and safety barriers from the work site.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 03 20 00 - *Concrete reinforcing*
- .2 Section 03 41 00 - *Precast structural concrete*
- .3 Section 26 05 00 - *Common work results for electrical*
- .4 Section 26 05 34 - *Conduits, conduit fastenings and conduit fittings*
- .5 Section 28 23 00 - *Video surveillance*
- .6 Section 28 31 00 - *Intrusion detection*
- .7 Section 31 23 33.01 - *Excavating, trenching and backfilling*

### **1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A 82/A 82M-05a, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - .2 ASTM C 478/C 478M-06, Standard Specification for Precast Reinforced Concrete Manhole Sections.
- .2 CSA Group (CSA)
  - .1 CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings for precast manholes.
- .2 Submit shop drawings for PVC conduits.

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

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - *Common Product Requirements*.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

## **Part 2 PRODUCTS**

### **2.1 PVC DUCTS**

- .1 PVC ducts, type DB2, encased in reinforced concrete.

### **2.2 PVC DUCT FITTINGS**

- .1 Rigid PVC opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation.
- .2 Rigid PVC 5-degree angle couplings.

### **2.3 PRECAST CONCRETE MANHOLES**

- .1 Precast concrete manholes and auxiliary sections fabricated in steel forms.
- .2 Aggregates: to CSA A23.1/A23.2.
- .3 CAN/CSA-A3001, Type GU.
- .4 Steel welded wire fabric mesh reinforcing: to ASTM A 82/A 82M.
- .5 Pulling inserts and bolts for racks integrally cast in concrete.
- .6 Neoprene gasket seals between manhole sections: to ASTM D 1056.
- .7 Cast iron manhole neck.
- .8 Bolted on covers to prevent unauthorized entry.
- .9 Size: 762 mm clear diameter.
- .10 Cast iron manhole frames and covers.
- .11 Precast Concrete Manholes: to ASTM C 478/C 478M.

### **2.4 CABLE PULLING EQUIPMENT**

- .1 Pull rope: 6 mm stranded polypropylene, tensile strength 5 kN, continuous throughout each duct run with 3 m spare rope at each end.

### **2.5 DOSAGE FORMULA**

- .1 Compressive strength: 25 MPa.

## **3 EXECUTION**

### **3.1 INSTALLATION GENERAL**

- .1 Install underground duct banks and precast manholes including formwork.

- .2 Build duct bank and manholes on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.
- .3 Open trench completely between manholes before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.
- .4 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.
- .5 Install base spacers at maximum intervals of 1.0 m levelled to grades indicated for bottom layer of ducts.
- .6 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 50 mm horizontally and vertically.
  - .1 Stagger joints in adjacent layers at least 150 mm and make joints watertight.
  - .2 Encase duct bank with 75mm thick concrete cover.
- .7 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degree with duct offset.
- .8 Use bell ends at duct terminations in manholes or buildings.
- .9 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.
- .10 Install the rebar as indicated.
- .11 Allow concrete to attain 50% of its specified strength before backfilling.
- .12 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete.
  - .1 Tie ducts to spacers with twine or other non-metallic material.
  - .2 Remove weights or wood braces before concrete has set and fill voids.
- .13 Clean ducts before laying:
  - .1 Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
- .14 Duct cleaning:
  - .1 Pull 300 mm long x diameter 6 mm less than internal diameter of duct steel wooden mandrel through each duct, immediately after placing of concrete.
  - .2 Then pull stiff bristle brush through duct; avoid disturbing or damaging ducts where concrete has not set completely.
  - .3 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .15 Install pull rope continuous throughout each duct run with 3 m spare rope at each end.

- .16 Concrete underground conduits dedicated to video surveillance and intrusion detection systems are approximately indicated in plans. The design of these systems is not final and will be performed in situ at the time of construction by the Department. The Contractor must coordinate with the disciplines involved and provide the conduit required for a complete, integrated, functional and safe installation. The quantities of ducts indicated on the tender form, in linear meters, are approximate. They will be adjusted for payment purposes according to the quantities installed.
- .17 Install four 0.3 m lengths of 10M reinforcing rods, one in each corner of duct bank when connecting duct to manholes or buildings.
  - .1 Wire rods to 10M dowels at manhole or building and support from duct spacers.
  - .2 Protect existing cables and equipment when breaking into existing manholes.
  - .3 Place concrete down sides of duct bank filling space under and around ducts.
  - .4 Rod concrete with flat bar between vertical rows filling voids.

### **3.2 QUALITY CONTROL ON SITE**

- .1 Inspections / Field Tests
  - .1 The duct inspection will be done by the Departmental Representative prior pouring the concrete.
  - .2 Concrete pouring and pipe cleaning shall be done in the presence of the Departmental Representative.

### **3.3 CLEANING**

- .1 Perform cleaning in accordance with Section 01 74 00 - *Cleaning*.
- .2 Upon completion of installation and performance review, remove surplus materials and materials, rubbish, tools and equipment from site.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 41 00 - *Precast structural concrete*;
- .2 Section 26 05 00 - *Common work results for electrical*;
- .3 Section 26 05 34 - *Conduits, conduit fastenings and conduit fittings*;
- .4 Section 31 23 33.01 - *Excavating, trenching and backfilling*;
- .5 Section 33 65 73 - *Concrete encased duct banks and manholes*.

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)/CSA International
  - .1 CSA C22.2 numéro 211.2-06 (R2016), Rigid PVC (Unplasticized) Conduit.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - *Common Product Requirements* and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer of packaging materials in accordance with Section 01 74 19 - *Waste Management and Disposal*.

**Part 2 PRODUCTS****2.1 PVC DUCTS AND FITTINGS**

- .1 Rigid PVC duct: Type DB2/ES2, with moulded fittings, for direct burial expanded flange ends, Trade size 6.
  - .1 Nominal length: 3 m plus or minus 12 mm.
  - .2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.
  - .3 Rigid PVC 90 degrees, 45 degrees bends, and couplings as required.

**2.2 SOLVENT WELD COMPOUND**

- .1 Solvent cement for PVC duct joints.

**2.3 CABLE PULLING EQUIPMENT**

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

## **2.4 WARNING TAPE**

- .1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW ".

## **Part 3 EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Install pipe in accordance with manufacturer's instructions and at elevations as indicated.
- .2 Clean inside of ducts before laying.
- .3 Slope ducts with 1 to 400 minimum slope.
- .4 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.
- .5 Pull through each duct steel mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.
  - .1 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .6 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .7 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.
- .8 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

### **3.3 CLEANING**

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

**END OF SECTION**

**APPENDIX 1 - Geotechnical and Environmental Characterization Report**





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February 19, 2018

Mister Alain Robitaille, Eng. PMP  
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Objet: Geotechnical and Environmental Characterization Report  
Replacement of the Perimeter Fence at the Cowansville Correctional Institution  
400 Fordyce Road, Cowansville, Quebec  
Y/FileN° : 29501TTJ (10CSP)  
O/File N° : 649001  
O/Document: rep-1

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Sir,

Please find attached the report concerning the geotechnical and environmental characterization report completed by SNC-Lavalin Environment and Geosciences (SNC-Lavalin), operating under the legal entity SNC-Lavalin GEM Quebec Inc., regarding the project mentioned above.

We hope that everything is to your entire satisfaction and we would like to extend, Mr. Robitaille, our best wishes.

**Philippe Gobeil, Eng. Jr.**  
Project Manager - Geotechnical  
*Environment and Geoscience*  
**Infrastructure Engineering**

PG/df

c.c. Mr. Philippe Guay, Eng. – Tetra Tech QI Inc. (digital copy)

p.j.

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# Replacement of the Perimeter Fence at the Cowansville Correctional Institution 400 Fordyce Road, Cowansville, Qc

Geotechnical and Environmental Characterization Report

Tetra Tech QI Inc.



Infrastructure

02 | 19 | 2018

Report > Client ref. Y/File N°: 29501TTJ (10CSP)

Internal ref. 649001 (rep-1)



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# Replacement of the Perimeter Fence at the Cowansville Correctional Institution 400 Fordyce Road, Cowansville, Quebec

## Geotechnical and Environmental Characterization Report

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Y/File N° : 29501TTJ (10CSP)  
O/File N° : 649001  
O/Document N° : rep-1

February 2018



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This report is composed of 126 pages including the appendices and may not be reproduced in whole or in part without the authorization of SNC Lavalin GEM Quebec Inc.

## 1 Introduction

The professional services of SNC-Lavalin Environment and Geosciences (SNC-Lavalin) were retained by Tetra Tech QI Inc. (Tetra Tech) in order to carry out a geotechnical study and environmental characterization of soils along the perimeter fence of the Cowansville correctional institution, located at 400 Fordyce Road in Cowansville, in the context of a project to replace the existing perimeter fence.

This mandate was performed in accordance with proposal No. 17-01286 dated June 8<sup>th</sup> 2017 along with additional requests and was accepted by Tetra Tech on September 8<sup>th</sup> 2017. These additional requests consisted of an environmental characterization and recommendations relating to the environmental management of excavated soils.

The purpose of this study was to determine the subsoil conditions and mechanical properties of the soil along with the groundwater level on site in order to provide relevant recommendations regarding foundation design.

The environmental characterization sought to verify the environmental quality of soils which will potentially be excavated during the project, between the surface and 2.0 m below ground level, in order to guide their off-site disposal or on-site reuse.

This report outlines the methods used during fieldwork and presents the results. It also contains comments and recommendations from a geotechnical point of view relative to foundation design of the new perimeter fence. Recommendations are also provided with respect to the environmental management of soils which may be excavated during the project.

The scope of the report is presented in Appendix 1.

## 2 Methodology

### 2.1 Fieldwork

The subsurface investigation was carried out from September 11<sup>th</sup> to 13<sup>th</sup> 2017. It included drilling 20 boreholes which were identified F-01 to F-20. Boreholes were drilled under the constant supervision of an SNC-Lavalin technician, specialized in geotechnical and environmental fieldwork.

Boreholes were drilled using a track-mounted Central Mine Equipment, model 75, drilling rig.

All boreholes were drilled using hollow stem augers to a depth of 3.05 m except for boreholes F-07 and F-19 which were ended at depths of 3.66 and 2.72 m, respectively. Soil samples were taken using a normalized split spoon sampler with a 51 mm outside diameter and 610 mm length, in accordance with the ASTM D 1586 standard describing the standard penetration test (SPT). This procedure is used in order to determine the N penetration values which are indicative of the state of compactness for non-cohesive soils. Furthermore, soil sampling was conducted in accordance with the requirements outlined in the *Guide d'échantillonnage à des fins d'analyses environnementales* published by the ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MDDELCC).

Plastic perforated standpipes were placed in boreholes F-01, F-04, F-08, F-13 and F-18 before the augers were removed in order to subsequently measure the subsurface water levels.

Borehole logs, preceded by explanatory notes, are presented in Appendix 2.

### 2.2 Surveying

Borehole position along the outside of the existing perimeter fence were localized by SNC-Lavalin and were approved by Tetra Tech. However, certain boreholes were relocated for safety reasons. A survey stake identifying the borehole number was left at each location after completion.

Borehole geodetic elevations were provided by Tetra Tech during a complementary survey.

### 2.3 Laboratory

All soil samples collected during drilling were transported to the SNC-Lavalin geotechnical laboratory for inspection and a detailed description. Some of the samples, considered as representative, were subjected to the laboratory program outlined in Table 1. The selection of samples for chemical analyses was done in order to guide the environmental management of soils with respect to depth. The parameters selected for chemical analyses sought to detect usual contaminants found in fill materials: metals, Polycyclic Aromatic Hydrocarbons (PAH) and Petroleum Hydrocarbons (C<sub>10</sub>-C<sub>50</sub>) (PH C<sub>10</sub>-C<sub>50</sub>) as well as F2 to F4 Petroleum Hydrocarbon fractions (PH F2-F4) for comparison to standards provided by the Canadian Council of Ministers of the Environment (CCME).

**Table 1 Laboratory Testing**

Test	Quantity
<b>Geotechnical Testing</b>	
Particle size analysis (sieve analysis)	20
Hydrometer analysis	5
<b>Chemical Analyses</b>	
Total extractible metals (Ag, As, Ba, Cd, Co, Cr, Cu, Sn, Mn, Hg, Mo, Ni, Pb, Se, Zn)	41
PAH	41
PH C <sub>10</sub> -C <sub>50</sub>	41
PH F2-F4	40

The results of the particle size distribution analyses are presented on Figures 1 to 6 in Appendix 3 and the results of the chemical analyses are provided on the analytical certificates presented in Appendix 4.

Soil samples not used in laboratory testing will be kept until February 2018. After that, the samples will be eliminated unless otherwise directed by Tetra Tech.

## 2.4 Assurance and Quality Control

### 2.4.1 Cleaning of Equipment and Sample Conservation

Equipment used during sampling (split spoon samplers, trowels, stainless steel bowls, etc.) was washed before each use with soap and water and were rinsed successively with distilled water, acetone, hexane and again with acetone before being finally rinsed with distilled water.

Samples were kept in coolers until they were placed in refrigerators before being transported to the analytical chemistry laboratory.

### 2.4.2 Control Samples

In order to verify the precision of the chemical analyses, field duplicates were prepared and were subjected to the same analytical testing program as their parent samples. Table 2 presents the complete list of collected duplicates and the chemical analyses that they were subjected to.

**Table 2 List of Samples and Duplicates**

Sample No.	Duplicata No.	Analysis
F-01/CF-1	DUP-1	-
F-03/CF-1	DUP-2	Metals, PAHs, PH C <sub>10</sub> -C <sub>50</sub> , PH F2-F4



**Table 2 List of Samples and Duplicates (continued)**

Sample No.	Duplicata No.	Analysis
F-05/CF-1B	DUP-4	-
F-07/CF-1B	DUP-5	Metals, PAHs, PH C <sub>10</sub> -C <sub>50</sub> , PH F2-F4
F-08/CF-1	DUP-6	-
F-10/CF-2	DUP-7	Metals, PAHs, PH C <sub>10</sub> -C <sub>50</sub> , PH F2-F4
F-12/CF-1	DUP-8	-
F-15/CF-1	DUP-9	-
F-19/CF-1	DUP-10	Metals, PAHs, PH C <sub>10</sub> -C <sub>50</sub> , PH F2-F4

### 2.4.3 Chemical Laboratory

Chemical analyses were performed by AGAT Laboratories (AGAT), an MDDELCC accredited laboratory for the selected analytical program. Laboratory analytical certificates produced by AGAT are presented in Appendix 4.

Chemical analyses were subjected to AGAT's internal quality control program. This program includes, among others, method blanks, duplicates, certified controls and spiked samples.

## 3 Study Results

### 3.1 Soil Nature and Properties

The detailed description of soils encountered in the 20 boreholes carried out within the scope of this study is presented on the borehole logs provided in Appendix 2. The stratigraphy of the soils based off the borehole data is summarized in Table 3.

**Table 3 Stratigraphic Summary**

Borehole No.	Topsoil		Fill		Peat		Alluvial Deposit		Till	
	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)
F-01	112.88	0.01	112.87	1.82	---	---	---	---	111.05	1.22
F-02	112.40	0.25	112.15	1.58	110.57	0.61	---	---	109.96	0.61
F-03	112.21	0.03	112.18	0.58	---	---	---	---	111.60	2.44
F-04	111.02	0.49 <sup>(1)</sup>	111.42	0.40	---	---	110.53	2.16	---	---
F-05	109.36	0.16 <sup>(1)</sup>	109.97	0.61	---	---	109.20	2.29	---	---
F-06	108.51 and 107.65	0.18 and 0.05 <sup>(1)</sup>	108.33	0.68	---	---	107.42	1.22	106.20	0.92
F-07	107.14	0.06	107.08	1.97	105.11	0.92	---	---	104.19	0.71
F-08	---	---	106.43	1.22	---	---	105.24	1.83	---	---
F-09	---	---	106.37	0.60	---	---	105.77	2.45	---	---
F-10	---	---	106.07	0.50	---	---	105.57	2.55	---	---
F-11	104.68	0.01 <sup>(1)</sup>	105.44	0.76	---	---	104.67	2.28	---	---
F-12	104.52	0.26 <sup>(1)</sup>	104.97	0.45	---	---	104.26	2.34	---	---
F-13	---	---	105.78	1.22	---	---	---	---	104.56	1.83

**Table 3 Stratigraphy Summary (continued)**

Borehole No.	Topsoil		Fill		Peat		Alluvial Deposit		Till	
	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)	Upper elev.(m)	Thickness (m)
F-14	106.01	0.10	105.91	1.12	---	---	104.79	0.68	104.11	0.15
F-15	---	---	108.34	1.22	---	---	---	---	107.12	1.83
F-16	---	---	110.47	0.61	---	---	---	---	109.86	2.44
F-17		---	111.14	1.22	---	---	---	---	110.92	1.83
F-18		---	113.68	0.80	---	---	---	---	112.88	2.25
F-19		---	114.07	0.25	---	---	113.82	0.48	113.34	1.99
F-20		---	113.54	0.61	---	---	---	---	112.93	2.44

Note 1: Layer of organic material encountered below the fill.

A description of the nature and properties of the main stratigraphic units is provided in the following paragraphs.

### 3.1.1 Topsoil

A thin layer or topsoil was observed directly from the surface in boreholes F-01 to F-03, F-06, F-07 and F-14. This same layer was noted beneath the fill material in boreholes F-04 to F-06, F-11 and F-12. The topsoil is principally composed of sand and silt with a large amount of organic material. The thickness of this layer varies between 10 mm and 490 mm.

### 3.1.2 Fill

Fill material was encountered in all boreholes, with thicknesses varying between 0.25 m and 1.97 m.

Based on the three particle size analyses performed on fill representative samples, along with a visual inspection of all other recovered samples, the composition generally consists of gravelly sand with a combined proportion of clay and silt greater than 20%. The results of the particle size analyses are presented in graphical form on Figure 1 of Appendix 3. It should be noted that organic material in the fill was observed in boreholes F-05, F-06, F-11 to F-14 and F-16 to F-19. Furthermore, debris (sheet metal) was observed in borehole F-14.

The N SPT values were measured on 12 occasions in the fill. These values fall within a range of 1 to 13, which is indicative of a fill with very loose to medium compactness.

### 3.1.3 Peat

A peat layer was indentified in boreholes F-02 and F-07, with a thickness of 0.61 and 0.92 m, respectively.

### 3.1.4 Alluvial Deposit

Directly beneath the fill material, in boreholes F-04 to F-06, F-08 to F-12, F-14 and F-19, an alluvial deposit was encountered. The thickness of this deposit varied between 0.48 and 2.55 m.

Particle size analyses were performed on ten samples recovered from this deposit. Three of these analyses were completed with hydrometer testing. The results, presented on Figures 2, 3 and 4 of Appendix 3, indicate that this deposit varies between a sand with some silt and traces of gravel to a silt and sand with traces of clay.

The N SPT values were measured on 30 occasions in this deposit. These values fall within a range of 1 to 18, which is indicative of an alluvial deposit with very loose to medium compactness.

### 3.1.5 Till

Till was encountered in boreholes F-01 to F-03, F-06, F-07, F-13 to F-20, sometimes directly beneath the fill material and in other instances beneath the alluvial deposit. The observed thickness varied between 0.15 and 2.44 m. None of the boreholes completely traversed the till deposit.

Particle size analyses were performed on two samples recovered from this deposit. Two of these analyses were completed with hydrometer testing. These results, presented on Figures 5 and 6 of Appendix 3, indicate that this deposit is generally composed of silty sand with some gravel and traces of clay.

The N SPT values were measured on 33 occasions in the till. With respect to boreholes F-07 and F-13 to F-20, the values are mostly comprised within 0 and 14 and are indicative of very loose to medium compactness. However, for boreholes F-01 to F-03, F-06, F-14 and in the lower portion of borehole F-15, the values fall between 20 and 80, indicating a medium to very dense compactness.

## 3.2 Organoleptic Indicators of Contamination

Besides the debris material observed in borehole F-14, no other organoleptic indicator of contamination was noted.

## 3.3 Chemical Analyses Results

### 3.3.1 Provincial Parameters and Results

The detailed results of the chemical analyses performed on the various soil samples are presented on the analytical certificates included in Appendix 4. They are also presented on Table 4-1 of the same appendix. Analytical results were compared to the A, B and C criteria of the *Action Guide - Soil Protection and Contaminated Sites Rehabilitation* (the Action Guide) and

the maximum values of Schedule I of the *Regulation Respecting the Burial of Contaminated Soils* (RRBCS).

Results were also compared to the maximum values of the *Regulation Respecting Contaminated Soil Storage and Contaminated Soil Transfer Stations* (RRCSSCSTS) and the *Land Protection and Rehabilitation Regulation* (LPRR). It should be noted that the maximum values of Schedules I and II of these regulations correspond to the B and C criteria of the Action Guide, respectively, although they do not refer to them by these denominations. Thus, to facilitate understanding, the terms “criteria B and C” are used indistinctly in this document to denote both the criteria of the Action Guide and the maximum values specified in Schedules I and II of the latter regulations.

It should also be noted that metal concentration values for criterion A are those suggested in the Action Guide for the Appalachian geological province.

Concentrations of Mn in the B-C range were measured in samples F-03/CF-3, F-06/CF-3, F-18/CF-3 and F-19/CF-3. Concentrations of Sn and Zn in the A-B range were measured in samples F-01/CF-2 and F-10/CF-1, respectively. All other measured concentrations are below the A criteria or the minimum detection limit as reported by the laboratory.

### 3.3.2 Federal Parameters and Results

The detailed results of the chemical analyses are also presented on Table 4-2 of the same Appendix and are compared to the federal criteria established by the CCME based on the measured parameters, the depth and particle size distribution of soils.

The results for metals and PAHs were compared to the *Canadian Environmental Quality Guidelines* CEQG for residential/park and commercial land use. The results for the chemical analyses for the PH F2-F4 were compared to the *Canada Wide Standards for Petroleum Hydrocarbons (PHC) in Soils* (CWS). The standards vary with respect to depth and particle size distribution of soils. Hence, the results were compared to the 1<sup>st</sup> section for surface soils (less than 3 m in depth) and for coarse soils. A concentration of Se greater than the CEQG for residential/park land use was measured in samples F-04/CF-1A, F-04/CF-3 and F-14/CF-3. All other measured concentrations were beneath the CEQG and the CWS for PH F2-F4.

### 3.3.3 Quality Control

The results of AGAT’s internal quality control program are presented on the analytical certificates included in Appendix 4. The results of these controls comply with the internal criteria established by AGAT, which are approved by the MDDELCC. Furthermore, the reported detection limits are equal or inferior to the A criteria for all analyzed parameters.

In order to evaluate the precision of the analytical results, the relative differences were calculated between the duplicates and their parent samples when at least one of either concentrations was at least 10 times greater than the detection limit. In this case, only the Mn concentrations meet this criterion. However, for samples F-07/CF-1B and DUP-5 (55%) and F-10/CF-1 and DUP-7 (31%), the relative differences are greater than the 30% limit suggested by the MDDELCC. For the first pair, this spread is probably due to the heterogeneity of the fill material in which the samples were obtained. For the second pair, the spread is very close to

the suggested limit, this small difference was deemed not significant. Therefore, the precision of the analytical results was judged adequate for the scope of this project.

### 3.3.4 Groundwater

The groundwater level was measured on the 13<sup>th</sup> of August 2017 in the plastic standpipes placed in boreholes F-01, F-04, F-08, F-13 and F-18. The results are presented in Table 4.

**Table 4 Groundwater Levels (2017-08-13)**

Borehole No.	Depth (m)	Elevation (m)
F-01	0.45	112,43
F-04	0.86	111,53
F-08	1.16	105,30
F-13	1.22	104,40
F-18	1.42	112,26

Based on these observations, the groundwater level is located near the surface, either in the alluvial or till deposit

It is important to note that groundwater levels can fluctuate and can be found at varying depths based on the year, seasons and various climatic conditions (heavy rain, snow melt, dry periods, etc.)

## 4 Comments and Recommendations

### 4.1 General Remarks

The project entails the construction of a new perimeter fence at the Cowansville correctional institution. This includes the construction of an interior fence which is supported by an anti-tunneling wall and a conventional exterior fence resting on isolated foundations.

Based on the information obtained from the boreholes, the stratigraphic profile of this sector is essentially composed of fill material resting on a uniform alluvial deposit with very loose to medium compactness, which is followed by a glacial till deposit composed of silty sand with some gravel with a loose to dense global compactness. Locally (boreholes F-02 and F-07), a peat layer was encountered beneath the fill.

On August 13<sup>th</sup> 2017, groundwater levels were located at depths varying between 0.45 and 1.42 m.

The following comments and recommendations suppose that 2.0 m excavations are required for the construction of the anti-tunneling wall and the isolated foundations of the exterior fence.

### 4.2 Frost Protection

In the Cowansville area, foundations exposed to frost effects should be placed at a minimum depth of 1.7 m beneath the finished ground surface. However, foundations exposed to frost action can be placed at a lesser depth if they are protected with thermal insulation such as polystyrene. For the design of such an insulator, it is suggested to follow the recommendations outlined in section 13.5.2 of the 2013 edition of the *Canadian Foundation Engineering Manual* (CFEM). For design purposes, a value of 1 100 °C-days for the normal freezing index can be used.

### 4.3 Liquefaction Potential

It is important to mention that the soils in the alluvial deposit have a priori the physical characteristics of a potentially liquefiable soil under the effects of a large magnitude earthquake.

### 4.4 Site Preparation

The site under consideration will be used for construction of a perimeter fence resting on an anti-tunneling wall, which will be supported by a strip footing. The foundation of the wall will be placed at a depth of 1.7 m on the alluvial deposit, till deposit or on a structural fill. Furthermore, the posts of the exterior fence will be supported by concrete filled sonotubes, which will be supported by the alluvial or till deposits.

The site can be partitioned in two distinct zones:

- › zone 1: the western facade for boreholes F-01 to F-03 and F-17 to F-20; and
- › zone 2: the north and southern sides for boreholes F-04 to F-16.

Each zone requires a different site preparation.

In all cases, topsoils fill material and peat must be excavated completely beneath the foundations down to the level of the alluvial or till deposit. In case that an over-excavation is required to reach the bearing layers of the alluvial and till deposits, a structural fill should be constructed as outlined in Section 4.6.2 of this report. This situation could occur at the location of boreholes F-01, F-02 and F-07.

In zone 1, for boreholes F-01 to F-03 and F-17 to F-20, the foundations can be supported directly on the compact to very dense till deposit.

In zone 2, for boreholes F-04 to F-16, the alluvial soils are generally in a very loose state so should be over-excavated by 300 mm and replaced by a structural fill as described in Section 4.6.2 of this report.

It is strongly recommended that a geotechnical engineer or a geotechnical technician supervised by an engineer be present during construction in order to confirm that the excavations have reached the alluvial or till deposits and to distinguish the limits between either of the zones previously mentioned.

## 4.5 Construction of the Exterior Fence

The exterior fence posts can be placed on sonotubes filled with concrete.

The base of these concrete foundations should be placed at depth of 2.0 m, in the alluvial or till deposits, 300 mm beneath the frost line depth.

Special consideration should be given in the areas around boreholes F-02 and F-07 where peat was observed at depths of 2.44 and 2.95 m, respectively. In all cases, post boreholes should reach the bearing layers of the alluvial or till deposits. For each post, a hole will be drilled with an auger with a minimum diameter of 1.5 times the diameter of the sonotubes. Considering the presence of peat and loose to very loose alluvial soils beneath the groundwater level, post boreholes must remain open when the sonotubes are inserted. When the concrete is placed in the sonotubes, they must be raised by 300 mm in order to form a larger base located at a greater depth than the frost line.

## 4.6 Foundations of the Anti-Tunneling Wall

The foundation for the anti-tunneling wall can be placed at a depth of 1.7 m on the alluvial deposit, till deposit or a structural fill when required.

## 4.7 Bearing Capacity

### 4.7.1 Ultimate Limit State Bearing Capacity (ULS)

For foundations which are supported by the alluvial deposit, till deposit or structural fill, the ULS bearing capacity can be calculated with the following equation, as indicated in Section 10.2.1 of the 2013 edition of the *Canadian Foundation Engineering Manual* (CFEM).



$$q_u = c N_c S_c + q_s N_q S_q + \frac{1}{2} \gamma B N_\gamma S_\gamma$$

where

- $q_u$  : ultimate limit state bearing capacity (kPa);  
 $c$  : soil cohesion (kPa);  
 $N_c, N_q, N_\gamma$  : dimensionless bearing capacity factors;  
 $S_c, S_q, S_\gamma$  : dimensionless modification factors to account for form, inclination, depth of the foundation and slope of the ground;  
 $q_s$  : effective stress at the level of the bottom of the foundation;  
 $\gamma$  : soil density (kN/m<sup>3</sup>);  
 $B$  : width of the foundation (m).

The geotechnical parameters to be used in this equation for the different support soils are presented in Table 5.

**Table 5 Geotechnical Parameters for Supporting Soils Beneath the Foundation for Determination of the ULS Bearing Capacity**

Soils	Geotechnical Parameters						
	c	$\phi'$	$N_c$	$N_q$	$N_\gamma$	$\gamma$	$\gamma'$
Structural fill	0	35°	46	33	37	21 kN/m <sup>3</sup>	11 kN/m <sup>3</sup>
Compacted alluvial deposit	0	30°	30	18	16	19 kN/m <sup>3</sup>	9 kN/m <sup>3</sup>
Till deposit	0	36°	51	38	44	21 kN/m <sup>3</sup>	11 kN/m <sup>3</sup>

The effective stress  $q_s$  due to the weight of soil at the foundation level can be determined by supposing the groundwater is located at a depth of 0.5 m. In the previous equation, the unit weight ( $\gamma$ ) can be used above this level and the submerged ( $\gamma'$ ) unit weight below.

Following the guidance of the CFEM, a resistance factor ( $\Phi$ ) of 0.5 must be applied to the calculated ULS bearing capacity in order to obtain the factored ULS bearing capacity.

#### 4.7.2 Serviceability Limit State Bearing Capacity (SLS)

A SLS bearing capacity of 150 kPa can be used for footings with a width of 1.5m or less, placed at a depth of 1.7 m with respect to the final grade level.

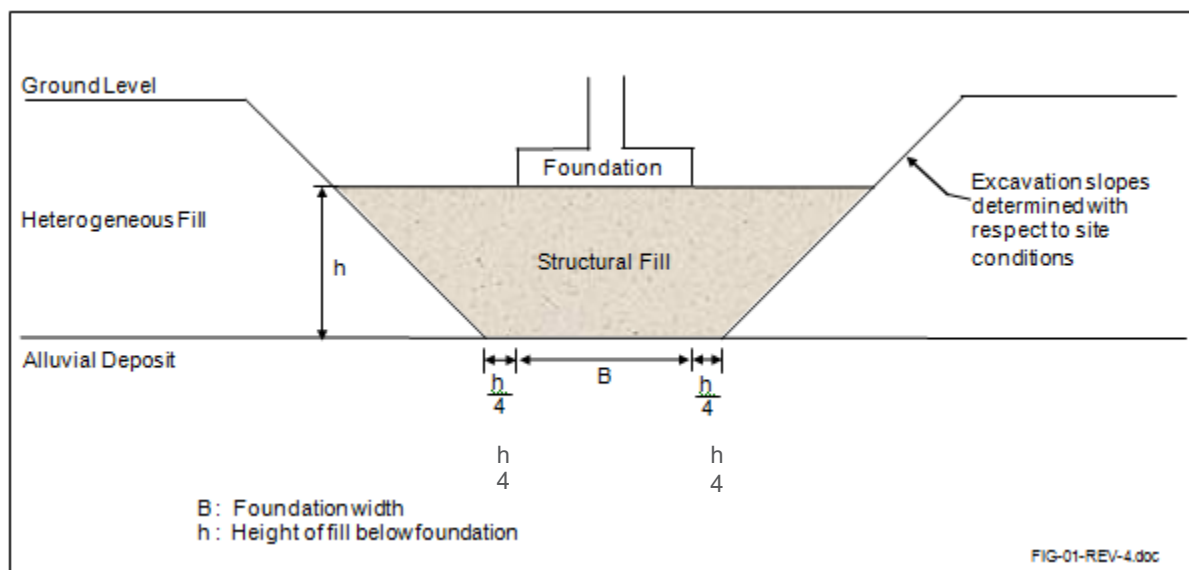
Under such a load, the anticipated total settlement will be less than 25 mm as long as the footings rest on a structural fill, compacted alluvial deposit or on the till deposit.

In order to avoid possible punching failure and in order to account for load eccentricity faults, the strip footings must have a width of at least 0.6 m.

#### 4.7.3 Structural Fill

The foundation pads and structural fill beneath the foundations should be composed of MG 20 or MG 112 (NQ-2560-114) materials placed in 300 mm layers and compacted to at least 95% of the modified Proctor value. However, the final 300 mm layer should be composed of MG 20 material. The width of the structural fill at the bottom of the excavation should be dimensioned with respect to Figure 1 below.

**Figure 1** Foundation Placed on a Structural Fill



## 4.8 Temporary Excavations

### 4.8.1 Nature of Soils to be Excavated

The excavations required to reach the alluvial and till deposits will reach a depth of 2 m and possibly 3 m in areas surrounding boreholes F-02 and F-07, in order to remove the fill, peat and topsoil. The excavations will therefore encounter the fill, peat, alluvial deposit and till.

## 4.8.2 Dewatering

On August 13<sup>th</sup> 2017, the groundwater level measured in boreholes F-01, F-04, F-08, F-13 and F-18 ranged between 0.42 and 1.42 m in depth, therefore at a shallower depth than the required excavations.

The contractor must consider appropriate means and methods in order to reduce the groundwater level to at least 0.3m below the foundation level. This precaution is required in order to avoid disturbing soils at the foundation level and to allow a proper compaction of the foundation pad and structural fill.

Considering the high permeability of the existing fill and the alluvial deposit, the lowering of the groundwater level is a crucial aspect to ensure that the construction is successful. The contractor should therefore employ careful consideration in this matter.

The contractor should therefore select an adequate pumping system. It is even possible that a well point system might be required. The contractor must determine the adequate spacing, depth, pumping rate and any other factors relating to this system. The contractor will also need to judge if the required equipment is available in order to make sure that the lowering of the groundwater level is effective. The contractor must observe the excavations, nature of soils in place and groundwater conditions in order to adjust the system as the work progresses in order to keep the system effective throughout construction. The contractor is considered a specialist in this field and therefore is responsible for proper dewatering of the excavations.

## 4.8.3 Unsupported Slopes

It is recommended that the slopes of the temporary excavations required for the construction of the foundation comply with the requirements put forth in the latest edition of the CNESST Safety Code for Construction Work. Given the fact that the construction method is unknown at this time, and since the excavations are temporary, slope stability of any excavation, the safety of workers and existing or planned structures is the sole responsibility of the contractor.

For information purposes, for temporary excavations of 3 m or less in depth, the slopes in the existing fill, alluvial deposit and the till deposit can be profiled with a 1 H : 1 V slope. It is important to emphasize that the previously mentioned slopes are intended only to help the designer for volume calculations and construction cost estimates.

The slope must be reduced if any signs of instability are observed. The excavation walls must therefore be inspected on a regular basis in order to identify any object that can fall into the excavation and create a risk to workers. Furthermore, traffic of heavy machinery and vehicles along with placing material stocks or piles of excavated material should be avoided around open excavations or placed at a minimum distance of at least the depth of the excavation in order to prevent slope instability. Backfilling should also be completed quickly in order to avoid the deterioration of the exposed slopes.

## 4.8.4 Reutilization of Excavated Soils

The excavated soils can be reused on-site except for surfaces upon which structures will be supported. They must be exempt of any organic material, peat or debris and must be put in place only when weather conditions allow (sunny and dry). Also, the water content must be adequate during compaction.

Since there is a large amount of fines in the fill material, in the alluvial deposit and in the till deposit, reusing these materials following their excavation on site will require particular attention and adequate equipment. If the excavations reach beneath the groundwater level, the materials with high contents of fines will be difficult to reuse immediately after their excavation since their water content will be too high to allow proper compaction. It may be necessary to temporarily store the excavated material in order to allow it to dry in order to reduce the water content to acceptable levels. If work is done during Winter, Spring or during rainy periods, the reutilization of such material can be difficult. Materials with a high fine content can become practically impossible to compact when they are too humid or frozen.

A specific study (water content, particle size analysis, etc.) should be undertaken at the beginning of construction for any project for which the soils will be reused, for materials which are brought from another site or use of the existing fill in order to verify that the properties of these materials are adequate with respect to the time of year and season when construction will be undertaken.

## 4.9 Environmental Soil Management

With respect to the current function of the concerned site (correctional institution), the Action Guide specifies that the B criteria values (Appendix I of the LPRR) is the regulatory limit after which environmental rehabilitation may be required. To this effect, it must be noted that concentrations in the A-B and B-C range were measured during the environmental characterization. Although it is possible that environmental rehabilitation of the soils up to the B criteria may be required considering article 31.57 of the *Environmental Quality Act* (EQA), two factors could modify this obligation:

- › the Cowansville correctional institution is under federal jurisdiction and is therefore considered federal land where provincial legislation does not apply. Therefore, it might not be necessary to rehabilitate the site. A legal opinion could be sought after concerning this issue; and
- › concentrations in the B-C range were measured in samples consisting of natural soil which did not present any indicators of contamination. Therefore, it is possible that these concentrations are local natural concentrations and site rehabilitation would not be required if it was proven that the concentrations are indeed natural. To this effect, a demonstration as outlined further below might be considered sufficient.

However, the disposal off site of excavated soils is regulated by the Action Guide and various EQA regulations, notably the RRCSSCSTS, the RRBCS and the *Regulation Respecting the Landfilling and Incineration of Residual Materials* (RRLIRM). Options for managing excavated soils are specified in the table provided in the Action Guide presented in Appendix 5 of this report. According to this table, A-B soils can be used as fill material on-site or on other properties, under certain conditions and are subject to the geotechnical comments previously mentioned in Sections 4.6 and 4.8.4 of this report. However, this table does not allow the reutilization on-site of excavated soils with concentrations in the B-C range due to the function of the site as a correctional institution. Excess excavated soils can be used as cover material for use in landfills authorized by the MDDELCC. It is important to mention that besides the recommendations provided in the soil management table, some sites have additional requirements relating to particle size distribution, permeability and proportion of debris.

As previously mentioned, it is possible that the measured concentrations in metals in natural soils are of natural origin. If it is demonstrated that these are natural concentrations, the Action Guide allows for the use of such soils without any environmental restriction. The document *Lignes directrices sur l'évaluation des teneurs de fond naturelles dans les sols*, published by the MDDELCC outlines the procedure required to demonstrate this possibility.

## Appendix 1

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Scope of the Report

## 1. Use of report

### a. Use of report

This report has been prepared, and the work mentioned herein was carried out by SNC-Lavalin GEM Québec Inc. (SNC-Lavalin) exclusively for the client (the Client), to whom the report is addressed, and who took part in developing the scope of work and understands the limitations. The methodology, findings, recommendations and results cited in this report are based solely on the scope of work and are subject to the requirements of time and budget, as described in the offer of services and/or the contract under which this report was issued. Use of this report or any decision based on its content by third parties is the sole responsibility of the third parties. SNC-Lavalin is not responsible for any damage incurred by third parties due to the use of this report or of any decision based on its content. The findings, recommendations and results cited in this report (i) have been prepared in accordance with the skill level normally demonstrated by professionals operating in similar conditions in the sector, and (ii) are determined according to the best judgment of SNC-Lavalin, taking into account the information available at the time the report was prepared. The professional services provided to the Client and the findings, recommendations and results cited in this report are not subject to any guarantee, express or implied. The findings and results cited in this report are only valid on the date of the report and may be based in part on information provided by third parties. This report may require modifications in case of inaccurate information, discovery of new information or changes in project parameters. The results of this study are in no way a guarantee that the site in the study is free of contamination. This report must be considered as a whole and its parts or sections must not be taken out of context. If discrepancies were to appear between the draft and the final version of this report, the final version shall prevail. Nothing in this report is mentioned with the intention to provide or constitute legal advice. The content of this report is confidential and proprietary. It is prohibited for any person other than the Client to reproduce or distribute this report, to use or take a decision based on its content, in whole or in part, without the express written permission of the Client and SNC-Lavalin.

### b. Modifications to project

The evidence, interpretations and recommendations contained in this report relate to the specific project as described in the report and do not apply to any other project or any other site. If the project is modified from a perspective of design, dimensioning, location or level, SNC-Lavalin must be consulted to confirm that the recommendations already given remain valid and enforceable.

### c. Number of soundings

The recommendations in this report are intended only as a guide for the design engineer. The number of soundings to determine all subsurface conditions that may affect construction (costs, techniques, equipment, schedule) should normally be greater than that for the purpose of design. The number of sample sites and chemical analyzes as well as the sampling frequency and choice of parameters can influence the nature and extent of corrective actions as well as treatment or disposal technology and cost. Contractors bidding or subcontracting the work should rely on their own research and their own interpretations of the surveys' factual results to assess how underground conditions can affect their work and the cost of work.

### d. Interpretation of data, comments and recommendations

Unless otherwise noted, data and results interpretation, comments and recommendations contained in this report are based, to the best of our knowledge, on environmental policies, criteria and regulations in force at the location of the project and on the production date of the report. If these policies, criteria and regulations are subject to change after submission of the report, SNC-Lavalin must be consulted to review the recommendations in the light of these changes. When no policy, criteria or regulation is available to allow for the interpretation of data and analytical results, comments or recommendations expressed by SNC-Lavalin are based on the best knowledge of the rules accepted in professional practice. The analyzes, comments and recommendations contained in this report are based on data and observations collected on the site, which come from sample work on the site. It is understood that only the data collected directly at the survey sites, sample sites and on the sample date are accurate and that any interpolation or extrapolation of these results to all or part of the site carries the risk of errors, which may themselves influence the nature and extent of the actions required on the site.

## 2. Sounding reports and interpretation of subsurface conditions

### a. Soil and rock descriptions

The soil and rock descriptions given in this report are from classification and identification methods commonly accepted and used in the practice of geotechnical engineering. The classification and identification of soil and rock involves judgment. SNC-Lavalin does not guarantee that the descriptions will be identical in all respects to those made by another geotechnician possessing the same knowledge of geotechnical rules, but ensures accuracy only to what is commonly used in geotechnical practice.

### b. Condition of soil and rock at sounding sites

The sounding reports only provide subsurface conditions and only at sounding sites. The boundaries between different layers on sounding reports are often approximate, rather corresponding to the transition zones and therefore subject to interpretation. The precision of subsurface conditions depends on the sounding method, frequency and method of sampling and consistency of the terrain encountered. The spacing between surveys, the sampling frequency and the type of sounding also reflect budgetary considerations and timelines that are outside the control of SNC-Lavalin.

### c. Condition of soil and rock between sounding sites

The soil and rock formations are variable over a considerably large area. Subsurface conditions between sounding sites are interpolated and may vary significantly from the conditions encountered at sounding sites. SNC-Lavalin can guarantee the results at the site where sounding are conducted. Any interpretation of the conditions presented between sounding sites carries risks. These interpretations can lead to the discovery of conditions that are different from those that were expected. SNC-Lavalin cannot be held responsible for the discovery of different soil and rock conditions from those described elsewhere than at the site where soundings are conducted.

### d. Groundwater levels

The groundwater levels provided in this report only correspond to those observed at the site and on the date indicated in the report and depends on the type of piezometric installation used. These conditions may vary based on the season or due to construction work on the site or on adjacent sites. These variations are beyond the control of SNC-Lavalin.

## 3. Contamination levels

The contamination levels described in this report (if within the scope) correspond to those detected at the site and on the date indicated in the report. These levels can vary based on the season or due to activities on the study site or on adjacent sites. These variations are beyond our control. Contamination levels are determined from the results of chemical analyzes of a limited number of soil, surface water or groundwater samples. The nature and degree of contamination between sample site may vary greatly. The chemical composition of groundwater at each sample site is likely to change due to groundwater flow, surface recharge conditions, stress of the formation investigated (i.e. pump or injection wells near the site) and natural seasonal variability. The accuracy of groundwater contamination levels depends on the frequency and the number of analyzes. The list of parameters analyzed is based on our best knowledge of the history of the site and the contaminants likely to be found on the site and is also a reflection of budgetary considerations and timelines. The fact that a parameter has not been analyzed does not exclude its presence at a concentration above the background noise or the detection limit of this parameter.

## 4. Study and work monitoring

### a. Final phase verification

All design and construction details are not known at the time of issue of the report. It is therefore recommended that SNC-Lavalin's services be retained to provide light on the possible consequences of construction on the final work.

### b. Inspection during execution

It is recommended that SNC-Lavalin's services be retained during construction to verify and confirm that groundwater conditions throughout the site do not differ from those given in the report and that the construction work will not have an adverse effect on the conditions of the site.

## 5. Changing conditions

The soil conditions described in this report are those observed during the study. Unless otherwise stated, these conditions are the basis for recommendations in the report. Soil conditions can be significantly affected by construction work (traffic, excavation, etc.) on the site or on adjacent sites. Excavation may expose the soil to changes due to humidity, drying or freezing. Unless otherwise indicated, the soil must be protected from these changes or rearrangements during construction. When conditions encountered at the site differ significantly from those provided in this report, due to the heterogeneous nature of the subsurface or due to construction work, it is the responsibility of the Client and the user of this report to notify SNC-Lavalin of changes and give SNC-Lavalin the opportunity to review the report's recommendations. Recognizing a change in ground conditions requires experience. It is therefore recommended that an experienced geotechnical engineer be dispatched to the site to see if conditions have changed significantly.

## 6. Drainage

Groundwater drainage is often required for both temporary and permanent project facilities. An incorrect drainage design or execution can have serious consequences. SNC-Lavalin cannot under any circumstance take responsibility for the effects of drainage unless SNC-Lavalin is specifically involved in the detailed design and monitoring of the drainage system's construction.

## 7. Environmental characterization – Phase I

This report was written after diligent research and evaluation of point data sources or information obtained from third parties that may present uncertainties, gaps or omissions. These sources of information are subject to change over time, for example, according to the progress of activities on the site and surrounding area. Phase I includes no testing, sampling or characterization analysis by a laboratory. Subject to exceptions, Phase I is based on the observation of visible and accessible components on the property and those nearby and could bring environmental harm to the quality of the land in the study. The property titles mentioned in this report are used to identify the former owners of the study site and cannot under any circumstance be considered as an official document for reproduction or other uses. Finally, any sketch, plan view or diagram appearing in the report or any statement specifying dimensions, capacities, quantities or distances are approximate and are included to help the reader visualize the property.

## Appendix 2

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Borehole Logs





# EXPLANATORY NOTES

## BOREHOLE AND TEST PIT LOG

(page 1 of 2)

The object of the borehole and test pit log is to present field and laboratory data concerning soil, bedrock and groundwater conditions. The purpose of this note is to explain the terminology, symbols and abbreviations used on the log.

### STRATIGRAPHY

#### 1. DEPTH - ELEVATION

The depth and elevation of contacts between the various geological strata are given in relation to the ground surface at the borehole or test pit location. Elevations refer to a datum as specified in the general heading of the log.

#### 2. SOIL DESCRIPTION

Soils are described according to their physical and geotechnical properties.

Soil particle size classification is given below:

IDENTIFICATION	PARTICLE SIZE (mm)	
Clay	<	0.002
Silt	0.002	- 0.08
Sand	0.08	- 5
Gravel	5	- 80
Cobble	80	- 300
Boulder	>	300

The proportion of each soil constituent, as identified by the particle size range, is defined by the following descriptive terms:

DESCRIPTION	PARTICLE SIZE FRACTION (%)	
Trace	1	- 10
Some	10	- 20
Adjective (ex.: sandy silt, silty)	20	- 35
And (ex.: sand and gravel)	>	35

#### 2.1 STATE OF COMPACTNESS OF COHESIONLESS SOILS

The state of compactness of cohesionless soils is evaluated using the "N-value" obtained during the Standard Penetration Test (SPT).

COMPACTNESS	N-VALUE (blows / 300 mm)	
Very loose	<	4
Loose	4	- 10
Compact	10	- 30
Dense	30	- 50
Very dense	>	50

#### 2.2 CONSISTENCY AND PLASTICITY OF COHESIVE SOIL

The consistency of cohesive soils is defined by the undrained shear strength. The undrained shear strength of the intact clay ( $s_u$ ) and remoulded clay ( $s_r$ ) is measured in situ or in the laboratory.

CONSISTENCY	UNDRAINED SHEAR STRENGTH, $s_u$ (kPa)	
Very soft	<	12
Soft	12	- 25
Firm	25	- 50
Stiff	50	- 100
Very stiff	100	- 200
Hard	>	200

DEGREE OF PLASTICITY	LIQUID LIMIT, $w_L$ (%)	
Low	<	30
Medium	30	- 50
High	>	50

#### 3. ROCK DESCRIPTION

Rock is described according to its geological origin, composition, structural characteristics and mechanical properties.

The Rock Quality Designation (RQD) is determined according to the ASTM D 6032 Standard.

CLASSIFICATION	RQD VALUE (%)	
Very poor quality	<	25
Poor quality	25	- 50
Fair quality	50	- 75
Good quality	75	- 90
Excellent quality	90	- 100

JOINT SPACING CLASSIFICATION	SPACING WIDTH (mm)	
Extremely close	0	- 60
Close	60	- 200
Moderately close	200	- 600
Wide	600	- 2000
Very wide	>	2000

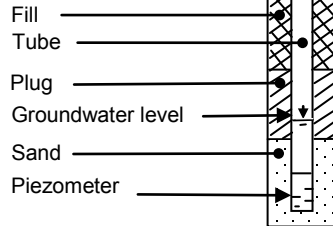
STRENGTH	UNCONFINED COMPRESSIVE STRENGTH, $q_u$ (MPa)	
Extremely weak	<	1
Very weak	1	- 5
Weak	5	- 25
Medium strong	25	- 50
Strong	50	- 100
Very strong	100	- 250
Extremely strong	>	250



# EXPLANATORY NOTES BOREHOLE AND TEST PIT LOG (page 2 of 2)

## GROUNDWATER LEVEL

The column "Groundwater Level" gives the groundwater level measured in a stand pipe, piezometer, monitoring well or directly in the borehole or test pit. The survey date is also indicated in this column. The sketch opposite illustrates the different symbols used.



## ABBREVIATIONS

- A Absorption, L/min-m (Packer Test in rock)
- CA Chemical analysis
- C Consolidation test
- C<sub>c</sub> Curvature coefficient
- C<sub>U</sub> Uniformity coefficient
- s<sub>u</sub> Intact undrained shear strength, measured with the field vane, kPa
- s<sub>r</sub> Remoulded undrained shear strength, measured with the field vane, kPa
- s<sub>us</sub> Intact undrained shear strength, measured with the Swedish fall-cone, kPa
- s<sub>rs</sub> Remoulded undrained shear strength, measured with the Swedish fall-cone, kPa
- s<sub>up</sub> Intact undrained shear strength, measured with the portable vane apparatus, kPa
- s<sub>rp</sub> Remoulded undrained shear strength, measured with the portable vane apparatus, kPa
- D<sub>r</sub> Relative density
- E<sub>M</sub> Pressuremeter modulus, kPa or MPa
- G Particle size distribution by sieve and washing
- I<sub>L</sub> Liquidity index
- I<sub>p</sub> Plasticity index, %
- k<sub>c</sub> Coefficient of permeability (hydraulic conductivity), measured in situ, m/s
- k<sub>L</sub> Coefficient of permeability (hydraulic conductivity), measured in the laboratory, m/s
- N<sub>dc</sub> Dynamic cone penetrometer blow count (DCPT)
- N Standard penetration test (SPT) index
- P<sub>80</sub> Sieve analysis by washing on the 80 μm sieve
- P<sub>L</sub> Pressuremeter limit pressure, kPa
- P<sub>r</sub> Proctor Test
- γ Unit weight, kN/m<sup>3</sup>
- γ' Effective unit weight, kN/m<sup>3</sup>
- q<sub>u</sub> Unconfined compressive strength of rock, MPa
- R Split spoon penetration refusal
- S Particle size distribution by hydrometer testing
- S<sub>t</sub> Sensitivity (s<sub>u</sub>/s<sub>r</sub>)
- CPV Corrosivity point value
- w Water content, %
- w<sub>L</sub> Liquid limit, %
- w<sub>p</sub> Plastic limit, %

## SAMPLES

### 1. TYPE AND NUMBER

The column "Type and Number" corresponds to the sample number. It includes 2 letters indicating the sample type followed by a sequence number. The sample types are as follows:

- SS : Split spoon
- LS : Large diameter sampler
- TW : Thin wall tube
- TU : Geoprobe™ sampling tube
- RC : Rock core
- GS : Grab sample
- AS : Auger sample

### 2. CONDITION

The depth, strength and condition of each sample is given in this column. The following symbols indicate the condition of the sample:



### 3. RECOVERY

Sample recovery corresponds to the recovered length of the sample in relation to the length of penetration of the sampler, expressed in percentage. The sample length is equal to the distance from the top of the sampler to the cutting edge whether or not the lower part of the sample is lost.

## IN SITU AND LABORATORY TESTS

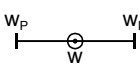
In situ and laboratory test results are indicated in the column "In Situ and Laboratory Tests" at the corresponding depth.

The following list of abbreviations identifies these tests.



**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-02**  
**DATE:** 2017-08-11  
**COORDINATES** : MTM NAD 83  
**E:** 360 682.4    **N:** 5 008 862.9

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS												
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS								
								$\Delta S_u$ (kPa)	$\nabla S_{us}$ (kPa)	$\Delta S_r$ (kPa)	$\nabla S_{rs}$ (kPa)		$\bullet N_{dc}$ (blows/300 mm)							
	112.40																			
		<b>Topsoil.</b>						20 40 60 80												
0.25	112.15	<b>Fill:</b> gravelly sand, some silt. Loose to very loose compactness.		CF-1	X	52	8*													
1				CF-2	X	38	8													
1.83	110.57	<b>Peat.</b>		CF-3	X	7	1													
2				CF-4	X	7	<1													
2.44	109.96	<b>Till:</b> silty and gravelly sand, trace clay. Compact compactness.		CF-5	X	66	22													
3																				
3.05	109.35	<b>End of borehole</b>																		
4																				
5																				
6																				

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.



**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-04**  
**DATE:** 2017-08-11  
**COORDINATES** : MTM NAD 83  
**E:** 360 783.4    **N:** 5 008 772.7

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL 2017-09-13	SAMPLES		IN SITU AND LABORATORY TESTS															
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)	OTHER TESTS												
										$\blacktriangle S_u$ (kPa) $\blacktriangledown S_{us}$ (kPa) $\triangle S_r$ (kPa) $\nabla S_{rs}$ (kPa) $\bullet N_{dc}$ (blows/300 mm)											
	111.42							$W_p$ $W_L$  $W$													
0.40	111.02	Fill: gravelly sand, some silt.		A	CF-1	89	9*														
		Topsoil.		B																	
0.88	110.55	Alluvial deposit: sand, some silt, trace gravel and clay.	▼	A	CF-2	72	6														
		Loose to compact compactness.		B																	
2					CF-3	85	17														
					CF-4	100	7														
3	3.05	108.37			CF-5	82	6														
		End of borehole																			

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-05**  
**DATE**: 2017-08-11  
**COORDINATES** : MTM NAD 83  
**E**: 360 874.1    **N**: 5 008 771.8

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS																			
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS															
				<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">20</td> <td style="width: 25%; text-align: center;">40</td> <td style="width: 25%; text-align: center;">60</td> <td style="width: 25%; text-align: center;">80</td> </tr> </table>				20	40	60	80	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">▲ S<sub>u</sub> (kPa)</td> <td style="width: 25%; text-align: center;">▼ S<sub>us</sub> (kPa)</td> <td style="width: 25%; text-align: center;">△ S<sub>r</sub> (kPa)</td> <td style="width: 25%; text-align: center;">▽ S<sub>rs</sub> (kPa)</td> </tr> <tr> <td colspan="4" style="text-align: center;">● N<sub>dc</sub> (blows/300 mm)</td> </tr> <tr> <td style="width: 25%; text-align: center;">20</td> <td style="width: 25%; text-align: center;">40</td> <td style="width: 25%; text-align: center;">60</td> <td style="width: 25%; text-align: center;">80</td> </tr> </table>				▲ S <sub>u</sub> (kPa)	▼ S <sub>us</sub> (kPa)	△ S <sub>r</sub> (kPa)	▽ S <sub>rs</sub> (kPa)	● N <sub>dc</sub> (blows/300 mm)				20	40	60	80
20	40	60	80																								
▲ S <sub>u</sub> (kPa)	▼ S <sub>us</sub> (kPa)	△ S <sub>r</sub> (kPa)	▽ S <sub>rs</sub> (kPa)																								
● N <sub>dc</sub> (blows/300 mm)																											
20	40	60	80																								
	109.97	Fill: sand, some silt. Presence of organic matter.		A	X	77	7*																				
0.60	109.37	Topsoil.		B	X																						
0.76	109.21	Alluvial deposit: uniform silty sand, trace clay. Loose compactness.		A	X	66	7																				
1				B	X																						
2				A	X	66	10				G																
3		Presence of organic matter at 3 m depth.		B	X																						
3.05	106.92	End of borehole		A	X	100	4																				
4				B	X																						
5				A	X	49	8																				
6				B	X																						

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-06**  
**DATE**: 2017-08-11  
**COORDINATES** : MTM NAD 83  
**E**: 360 965.7    **N**: 5 008 771.7

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS											
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS							
								$\Delta S_u$ (kPa)	$\nabla S_{us}$ (kPa)	$\Delta S_r$ (kPa)	$\nabla S_{rs}$ (kPa)		$\bullet N_{dc}$ (blows/300 mm)						
	108.51							$\frac{W_p}{W} \quad \frac{W_L}{W}$											
0.18	108.33	<b>Topsoil.</b> Fill: sand, some silt. Presence of organic matter.		CF-1	A X B	82	5*												
0.86	107.65	<b>Topsoil.</b>		CF-2	A X B	82	5												
0.91	107.60	<b>Alluvial deposit:</b> silt and sand, trace clay. Loose compactness.		CF-3	X	82	6												
2.13	106.38	<b>Till:</b> silty and gravelly sand, trace clay. Compact to dense compactness.		CF-4	X	67	17												
3.05	105.46	<b>End of borehole</b>		CF-5	X	54	33												

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.



**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-07**  
**DATE**: 2017-08-11 and 2017-09-12  
**COORDINATES** : MTM NAD 83  
**E**: 361 045.1    **N**: 5 008 771.1

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES		IN SITU AND LABORATORY TESTS						
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS
								$W_p$	$W_L$	$W$		
	107.14									● $N_{dc}$ (blows/300 mm)		
	20 40 60 80											
0.06	107.08	<b>Topsoil.</b> Fill: silty sand. Loose compactness.		A	CF-1	B	70	8*				
1					CF-2	A	90	7	G			
2					CF-3	A	100	4				
2.03	105.11	<b>Peat.</b>		A	CF-4	B	93	1				
3					CF-5	A	100	1				
2.95	104.19	<b>Till: silty and gravelly sand, trace clay.</b> Compact compactness.			CF-6	A	82	14				
3.66	103.48	<b>End of borehole</b>										
4												
5												
6												

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.



**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-09**  
**DATE:** 2017-08-12  
**COORDINATES** : MTM NAD 83  
**E:** 361 140.3    **N:** 5 008 864.4

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS											
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS							
								$\blacktriangle S_u$ (kPa)	$\blacktriangledown S_{us}$ (kPa)	$\triangle S_r$ (kPa)	$\nabla S_{rs}$ (kPa)		$\bullet N_{dc}$ (blows/300 mm)						
	106.37							$\frac{W_p}{W} \frac{W_L}{W}$											
0.60	105.77	<b>Fill:</b> silty sand, some gravel.  <b>Alluvial deposit:</b> uniform sand, some silt, trace clay and gravel becoming silt and sand, trace clay.  Very loose to loose compactness.		CF-1	X	74	3*												
1				CF-2	X	82	1												
2				CF-3	X	62	2												
3				CF-4	X	82	5												
3	3.05	103.32		CF-5	X	90	4												
		<b>End of borehole</b>																	

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.



**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-11**  
**DATE**: 2017-08-12  
**COORDINATES** : MTM NAD 83  
**E**: 361 142.2    **N**: 5 009 044.1

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS																			
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS															
								$\frac{W_p}{W} \quad \frac{W_L}{W}$																			
				<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">20</td> <td style="width: 25%; text-align: center;">40</td> <td style="width: 25%; text-align: center;">60</td> <td style="width: 25%; text-align: center;">80</td> </tr> </table>				20	40	60	80	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">▲ S<sub>u</sub> (kPa)</td> <td style="width: 25%; text-align: center;">▼ S<sub>us</sub> (kPa)</td> <td style="width: 25%; text-align: center;">△ S<sub>r</sub> (kPa)</td> <td style="width: 25%; text-align: center;">▽ S<sub>rs</sub> (kPa)</td> </tr> <tr> <td colspan="4" style="text-align: center;">● N<sub>dc</sub> (blows/300 mm)</td> </tr> <tr> <td style="width: 25%; text-align: center;">20</td> <td style="width: 25%; text-align: center;">40</td> <td style="width: 25%; text-align: center;">60</td> <td style="width: 25%; text-align: center;">80</td> </tr> </table>				▲ S <sub>u</sub> (kPa)	▼ S <sub>us</sub> (kPa)	△ S <sub>r</sub> (kPa)	▽ S <sub>rs</sub> (kPa)	● N <sub>dc</sub> (blows/300 mm)				20	40	60	80
20	40	60	80																								
▲ S <sub>u</sub> (kPa)	▼ S <sub>us</sub> (kPa)	△ S <sub>r</sub> (kPa)	▽ S <sub>rs</sub> (kPa)																								
● N <sub>dc</sub> (blows/300 mm)																											
20	40	60	80																								
105.44		Fill: silty sand, trace gravel. Presence of organic matter.																									
0.76 0.77	104.68 104.67	<b>Topsoil.</b> Alluvial deposit: uniform silty sand, trace clay. Very loose to compact compactness.		CF-1	X	77	4*																				
1				CF-2	X	89	2																				
2				CF-3	X	80	11				G																
3				CF-4	X	100	6																				
3	3.05	102.39	<b>End of borehole</b>	CF-5	X	100	4																				
4																											
5																											
6																											

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-12**  
**DATE**: 2017-08-12  
**COORDINATES** : MTM NAD 83  
**E**: 361 142.7    **N**: 5 009 130.0

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS								
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS				
								$\frac{W_p}{W}$	$\frac{W_L}{W}$				$\blacktriangle S_u$ (kPa) $\blacktriangledown S_{us}$ (kPa) $\triangle S_r$ (kPa) $\nabla S_{rs}$ (kPa)	$\bullet N_{dc}$ (blows/300 mm)		
	104.97							20	40	60	80		20	40	60	80
0.45	104.52	Fill: silty sand, trace gravel. Presence of organic matter.		CF-1	X	84	4*									
0.71	104.26	Topsoil. Alluvial deposit: uniform sand and silt, trace clay. Compact to very loose compactness.		CF-2	X	82	15									
1				CF-3	X	64	8					G S				
2				CF-4	X	100	2									
3	3.05	101.92		CF-5	X	100	1									
		<b>End of borehole</b>														

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-13**  
**DATE:** 2017-08-12  
**COORDINATES** : MTM NAD 83  
**E:** 361 130.2    **N:** 5 009 188.9

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL 2017-09-13	SAMPLES				IN SITU AND LABORATORY TESTS				
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS
								$\Delta S_u$ (kPa)	$\nabla S_{us}$ (kPa)	$\Delta S_r$ (kPa)	$\nabla S_{rs}$ (kPa)	
	105.78							$\frac{W_p}{W} \frac{W_L}{W}$		$\bullet N_{dc}$ (blows/300 mm)		
								20 40 60 80		20 40 60 80		
1	1.22 104.56	<b>Fill:</b> sandy gravel, some silt. Presence of organic matter. Very loose compactness.		CF-1		46	11*		G			
1.22	104.56	<b>Till:</b> silty sand, some gravel, trace clay. Presence of organic matter at about 2.5 m depth. Loose to compact compactness.		CF-2		41	3		G			
1.38	104.40	<b>Till:</b> silty sand, some gravel, trace clay. Presence of organic matter at about 2.5 m depth. Loose to compact compactness.		CF-3		74	5		G	S		
2		<b>Till:</b> silty sand, some gravel, trace clay. Presence of organic matter at about 2.5 m depth. Loose to compact compactness.		CF-4		82	6		G	S		
3	3.05 102.73	<b>End of borehole</b>		CF-5		100	13		G	S		
4		<b>End of borehole</b>										
5		<b>End of borehole</b>										
6		<b>End of borehole</b>										

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-14**  
**DATE**: 2017-08-12  
**COORDINATES** : MTM NAD 83  
**E**: 361 047.1    **N**: 5 009 203.1

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES			IN SITU AND LABORATORY TESTS								
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS			
	106.01							$\frac{W_p}{W} \text{---} \frac{W_L}{W}$					▲ S <sub>u</sub> (kPa)   ▼ S <sub>us</sub> (kPa) △ S <sub>r</sub> (kPa)   ▽ S <sub>rs</sub> (kPa) ● N <sub>dc</sub> (blows/300 mm)		
								20	40	60	80	20	40	60	80
0.10	105.91	<b>Topsoil.</b> Fill: silty sand to sand with some silt, some gravel.  Presence of debris.  Loose compactness.		CF-1	A B	33	5*								
1.22	104.79	<b>Alluvial deposit:</b> uniform sandy silt, trace clay.  Presence of organic matter in the upper portion of the deposit.  Loose to compact compactness.		CF-2		36	9								
				CF-3		100	6					G			
				CF-4		90	6								
2.90	103.11	<b>Till:</b> sand and silt, some gravel.		CF-5	A B	74	18								
3.05	102.96	<b>End of borehole</b>													

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.



**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-15**  
**DATE**: 2017-08-13  
**COORDINATES** : MTM NAD 83  
**E**: 360 934.3    **N**: 5 009 202.5

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS					
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS	
				$\blacktriangle S_u$ (kPa) $\blacktriangledown S_{us}$ (kPa) $\triangle S_r$ (kPa) $\nabla S_{rs}$ (kPa) $\bullet N_{dc}$ (blows/300 mm)									
	108.34	Fill: silty sand, some gravel.  Till: sand and silt, some gravel, trace clay. Presence of organic matter to a depth of 1.32 m. Loose compactness.  Till: silty and gravelly sand, trace clay.  Dense to very dense compactness.		CF-1	X	57	16*	20	40	60	80		
1			CF-2	X	20	4							
1.22	107.12		CF-3	X	54	7							G
1.83	106.51		CF-4	X	66	30							
2			CF-5	X	79	82							
3	3.05	105.29	<b>End of borehole</b>										
4													
5													
6													

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-16**  
**DATE**: 2017-08-13  
**COORDINATES** : MTM NAD 83  
**E**: 360 825.7    **N**: 5 009 202.7

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS												
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS								
								$\frac{W_p}{W}$	$\frac{W_L}{W}$				$\blacktriangle S_u$ (kPa) $\blacktriangledown S_{us}$ (kPa) $\triangle S_r$ (kPa) $\nabla S_{rs}$ (kPa)	$\bullet N_{dc}$ (blows/300 mm)						
0.61	109.86	<b>Fill:</b> silty sand, some gravel. Presence of organic matter.		CF-1	X	84	12*													
1		<b>Till:</b> silty sand, some gravel, trace clay. Loose to very loose compactness.		CF-2	X	82	8				G									
2				CF-3	X	46	7													
3				CF-4	X	66	0													
3	3.05	107.42		CF-5	X	74	3													
		<b>End of borehole</b>																		

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-17**  
**DATE**: 2017-08-13  
**COORDINATES** : MTM NAD 83  
**E**: 360 757.2    **N**: 5 009 204.1

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS				
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS
				$\blacktriangle S_u$ (kPa) $\blacktriangledown S_{us}$ (kPa) $\triangle S_r$ (kPa) $\nabla S_{rs}$ (kPa) $\bullet N_{dc}$ (blows/300 mm)								
	111.74							20 40 60 80	20 40 60 80			
1		<b>Fill:</b> silty sand, some gravel. Presence of organic matter Loose compactness.		CF-1	X	62	11*					
1.22	110.52	<b>Till:</b> sand and silt, some gravel, trace clay. Compact compactness.		CF-2	X	57	7					
1.83	109.91	<b>Till:</b> silty and gravelly sand, trace clay. Compact to dense compactness.		CF-3	X	56	14			G		
2				CF-4	X	67	23					
3				CF-5	X	51	47					
3.05	108.69	<b>End of borehole</b>										
4												
5												
6												

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.



**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
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**FILE** : 649001

**BOREHOLE : F-19**  
**DATE**: 2017-08-13  
**COORDINATES** : MTM NAD 83  
**E**: 360 681.9    **N**: 5 009 108.9

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES		IN SITU AND LABORATORY TESTS				OTHER TESTS		
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				
								$\frac{W_p}{W}$	$\frac{W_L}{W}$			
	114.07							20   40   60   80		20   40   60   80		
0.25	113.82	<b>Fill: silty sand.</b> Presence of organic matter. <b>Alluvial deposit: sand, trace silt.</b>		CF-1	X	49	4*					
0.73	113.34	<b>Till: gravelly and silty sand, trace clay.</b> Presence of cobbles. Loose to very loose compactness.		CF-2	X	41	7					
1				CF-3	X	79	26					
2				CF-4	X	51	43					
2.72	111.35	<b>End of borehole</b>		CF-5	X	100	R					
3												
4												
5												
6												

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001

**BOREHOLE : F-20**  
**DATE:** 2017-08-13  
**COORDINATES** : MTM NAD 83  
**E:** 360 682.3    **N:** 5 009 030.6

DEPTH (m)	ELEVATION (m) GEODETTIC	DESCRIPTION	WATER LEVEL	SAMPLES				IN SITU AND LABORATORY TESTS																
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG'S LIMITS (%)				OTHER TESTS												
								$\frac{W_p}{W}$	$\frac{W_L}{W}$				$\blacktriangle S_u$ (kPa) $\blacktriangledown S_{us}$ (kPa) $\triangle S_r$ (kPa) $\nabla S_{rs}$ (kPa) $\bullet N_{dc}$ (blows/300 mm)											
				20	40	60	80	20	40	60	80													
0.61	113.54	Fill: gravelly and silty sand.  Till: silty and gravelly sand, trace clay. Compact to very dense compactness.		CF-1	X	82	11*																	
1	112.93			CF-2	X	90	11																	
2				CF-3	X	87	38																	G
3				CF-4	X	82	47																	
3	110.49			CF-5	X	85	62																	
3.05		<b>End of borehole</b>																						

**REMARKS:** \* Sample CF-1 was taken by means of a "N" size split spoon sampler with an outside diameter of 64 mm.

**DRILLING METHOD:** Rotation of hollow stem augers.

## Appendix 3

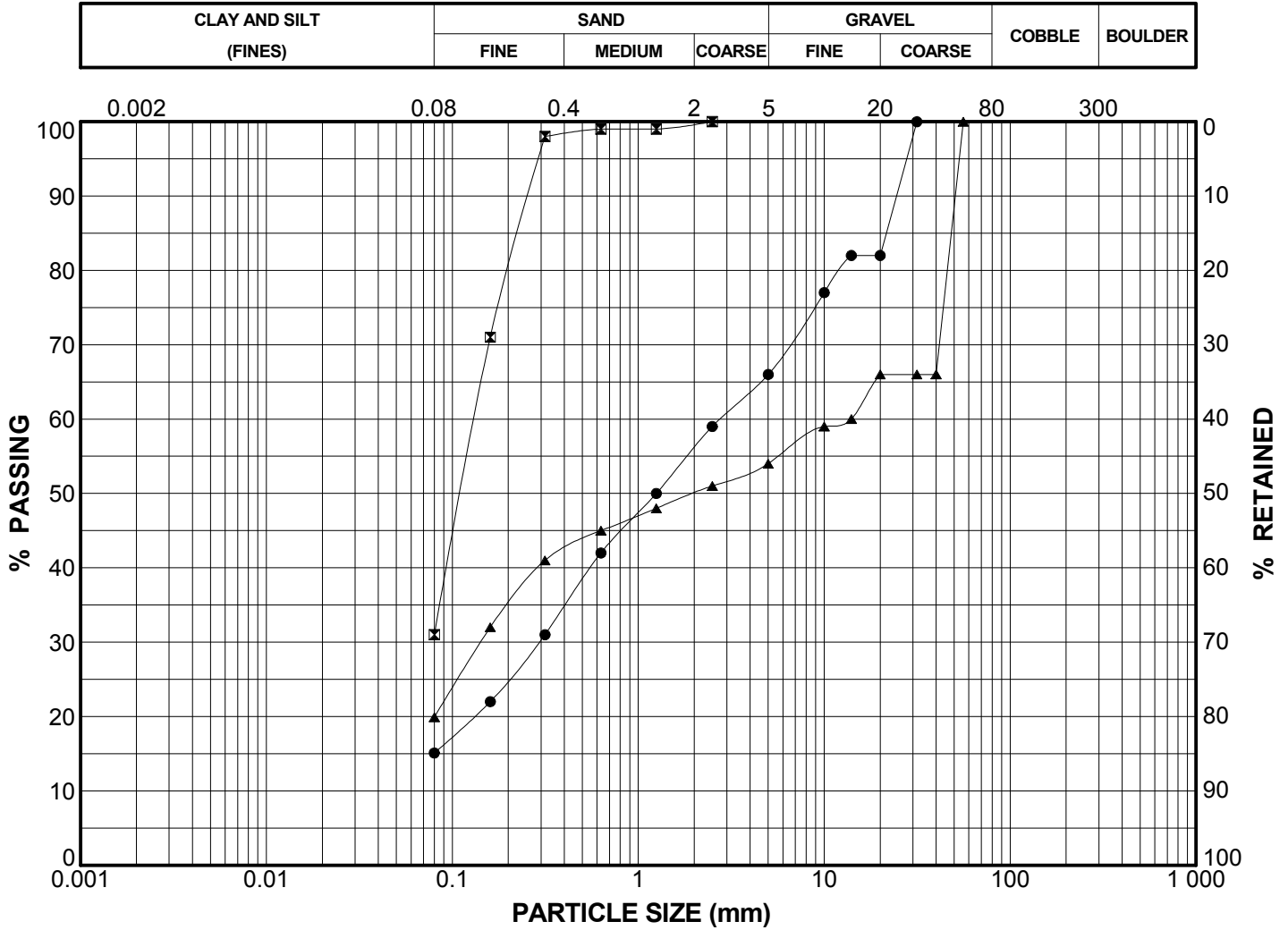
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### Geotechnical Testing Results

# PARTICLE SIZE DISTRIBUTION

Figure 1

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001



	Boring and/or Test Pit	Sample	Depth (m)		Gravel (%)	Sand (%)	Silt and Clay (%)	Description
			from	to				
●	F-02	CF-2	0.61	1.22	34	51	15	Fill: gravelly sand, some silt.
☒	F-07	CF-2	0.61	1.22	0	69	31	Fill: : silty sand.
▲	F-13	CF-1	0.00	0.61	46	34	20	Fill: : sandy gravel, some silt.

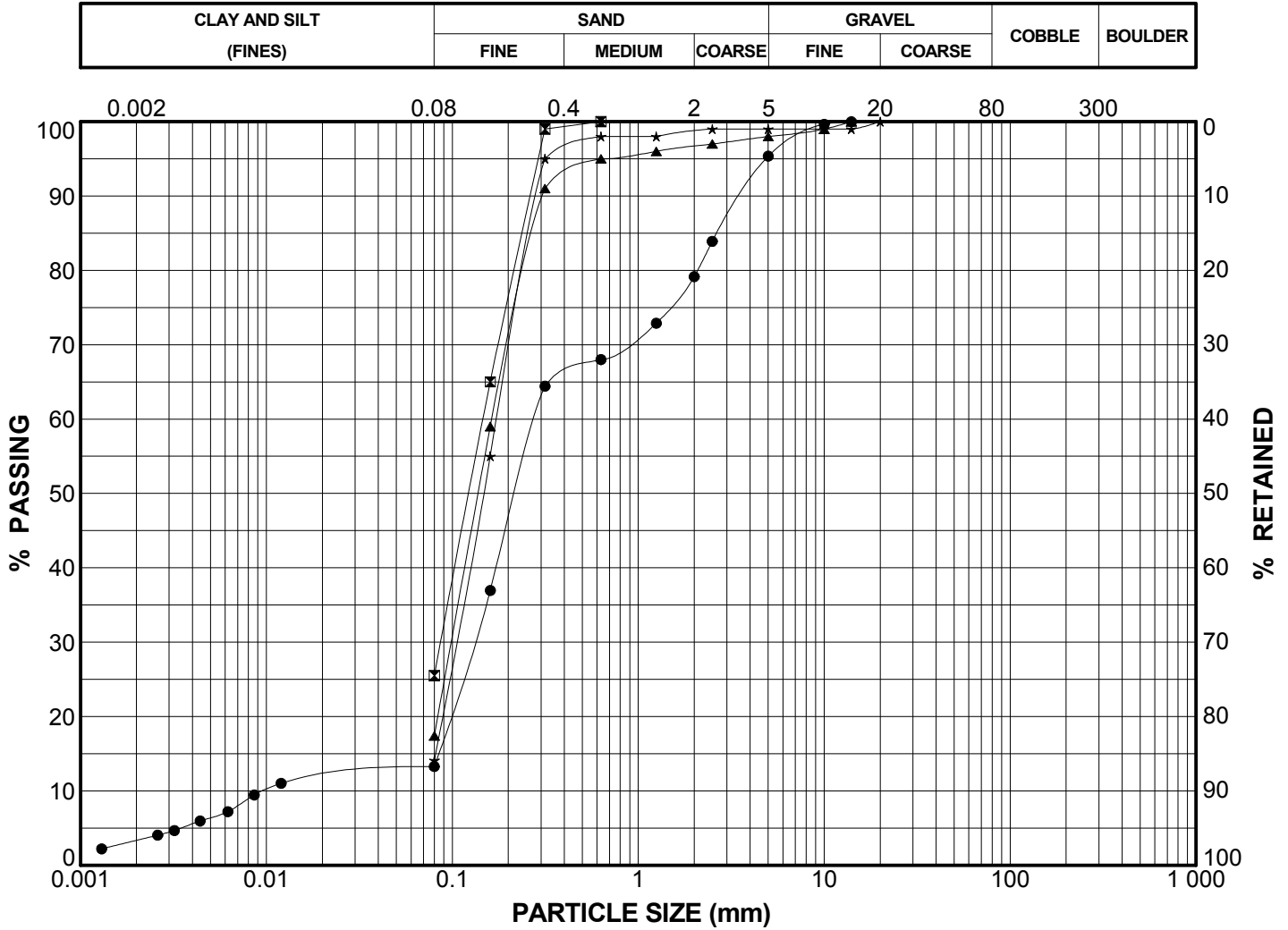
**REMARKS :**



# PARTICLE SIZE DISTRIBUTION

Figure 2

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001



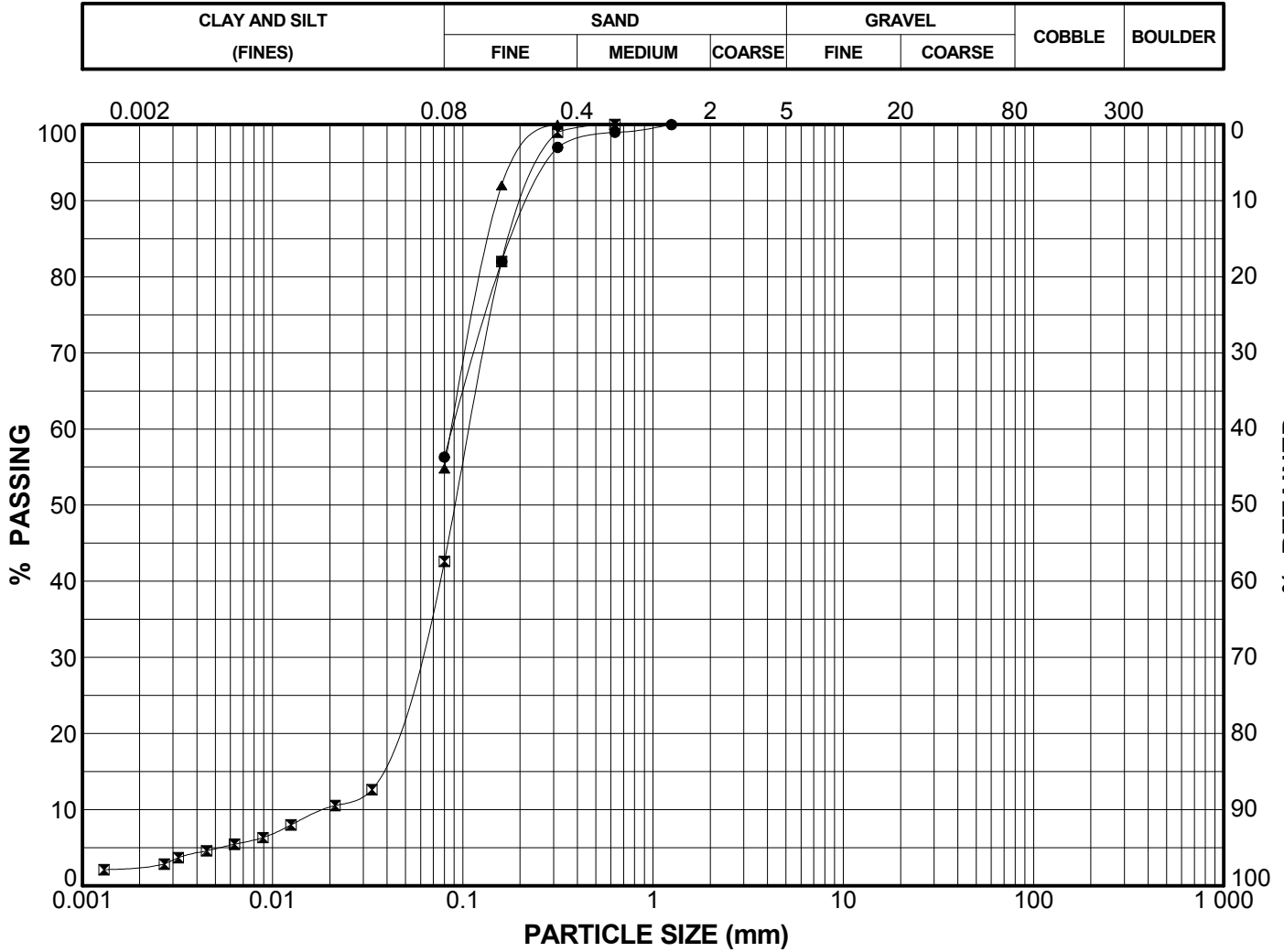
	Boring and/or Test Pit	Sample	Depth (m)		Gravel (%)	Sand (%)	Silt and Clay (%)		Description
			from	to					
●	F-04	CF-3	1.22	1.83	5	82	10	3	<b>Alluvial deposit:</b> sand, some silt, trace gravel and clay.
☒	F-05	CF-3	1.22	1.83	0	75		26	<b>Alluvial deposit:</b> silty sand, trace clay.
▲	F-09	CF-2	0.61	1.22	2	81		17	<b>Alluvial deposit:</b> sand, some silt, trace gravel and clay.
★	F-10	CF-3	1.22	1.83	1	85		14	<b>Alluvial deposit:</b> sand, some silt, trace gravel and clay.

**REMARKS :**

# PARTICLE SIZE DISTRIBUTION

Figure 3

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001



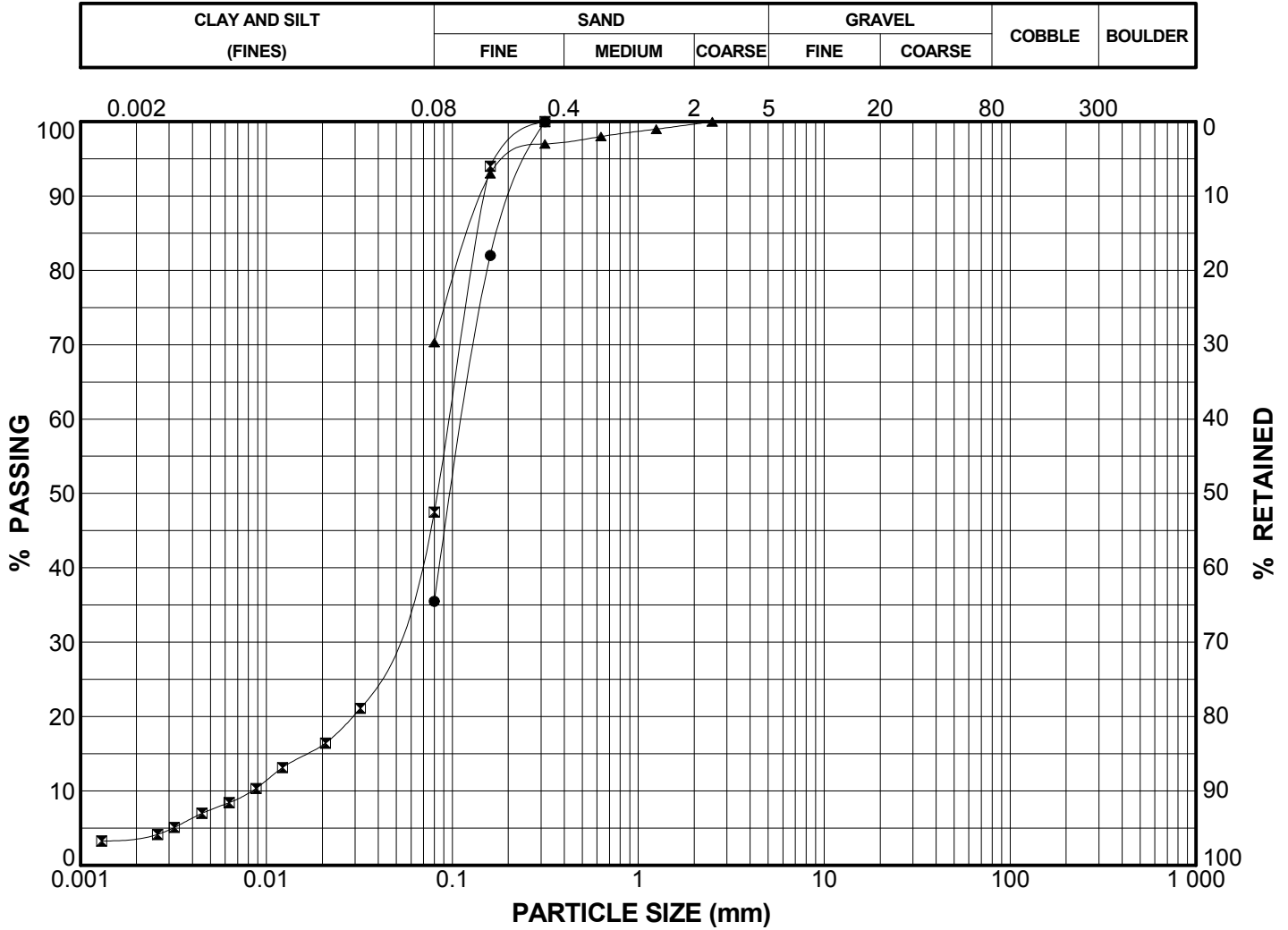
	Boring and/or Test Pit	Sample	Depth (m)		Gravel (%)	Sand (%)	Silt and Clay (%)		Description
			from	to					
●	F-06	CF-3	1.22	1.83	0	44	56		<b>Alluvial deposit:</b> silt and sand, trace clay.
☒	F-08	CF-3	1.22	1.83	0	57	40	3	<b>Alluvial deposit:</b> sand and silt, trace clay.
▲	F-09	CF-4	1.83	2.44	0	45	55		<b>Alluvial deposit:</b> silt and sand, trace clay.

**REMARKS :**

# PARTICLE SIZE DISTRIBUTION

Figure 4

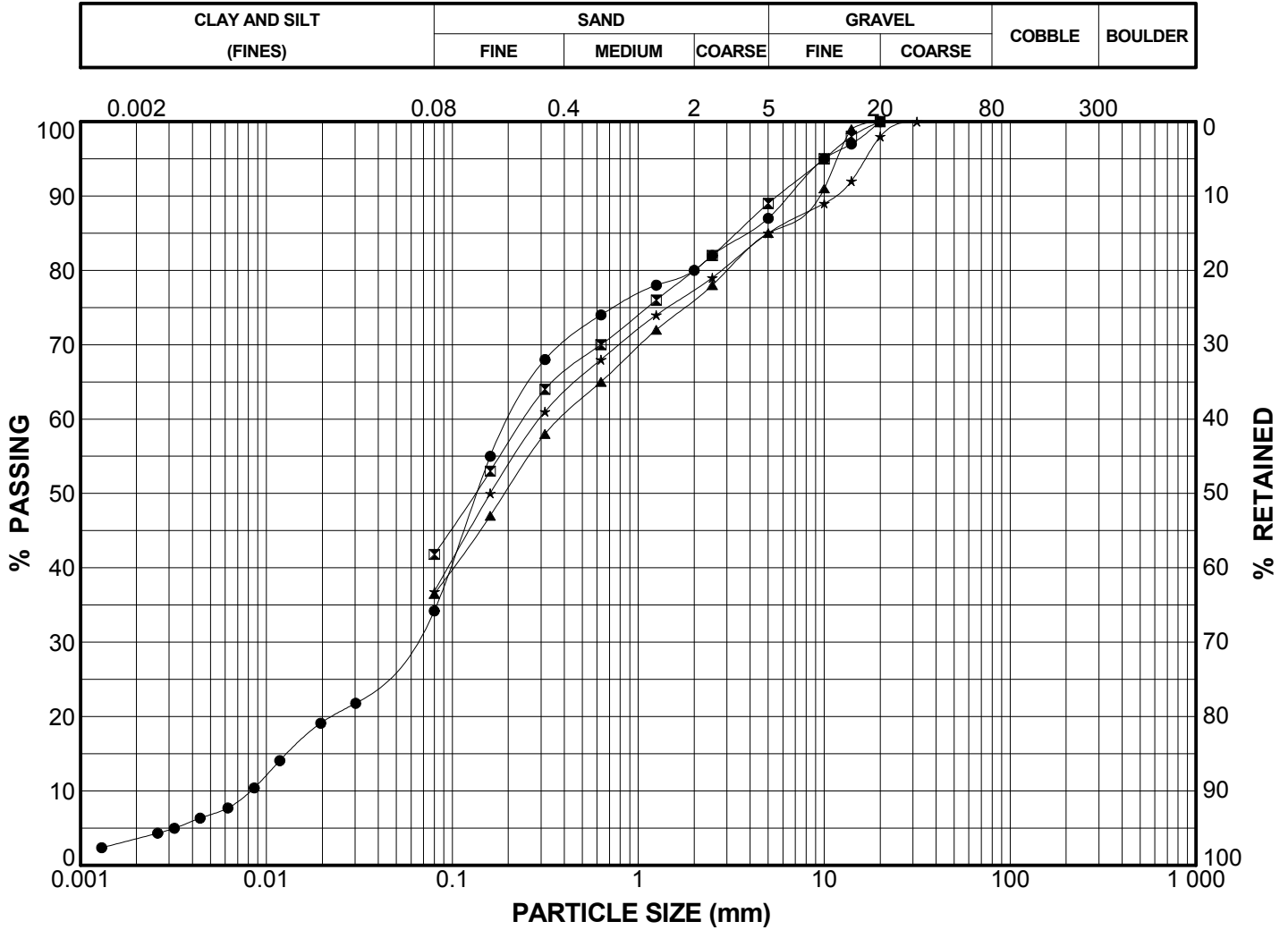
**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001



	Boring and/or Test Pit	Sample	Depth (m)		Gravel (%)	Sand (%)	Silt and Clay (%)		Description
			from	to					
●	F-11	CF-3	1.22	1.83	0	65	36		<b>Alluvial deposit:</b> silty sand, trace clay.
⊠	F-12	CF-3	1.22	1.83	0	53	44	4	<b>Alluvial deposit:</b> sand and silt, trace clay.
▲	F-14	CF-3	1.22	1.83	0	30	70		<b>Alluvial deposit:</b> sandy silt, trace clay.

**REMARKS :**

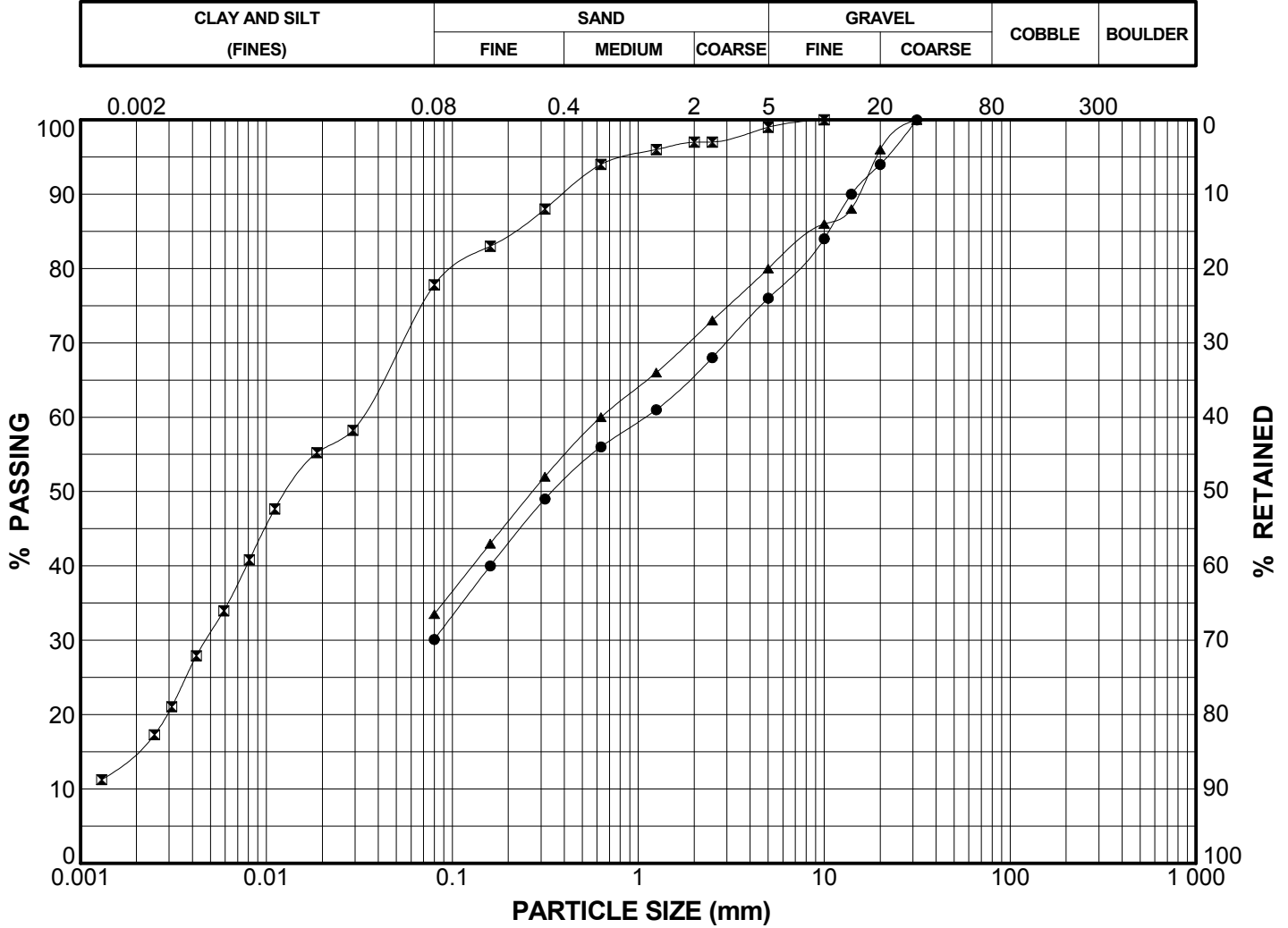
**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001



	Boring and/or Test Pit	Sample	Depth (m)		Gravel (%)	Sand (%)	Silt and Clay (%)		Description
			from	to					
●	F-13	CF-3	1.22	1.83	13	53	31	4	Till: silty sand, some gravel, trace clay.
☒	F-15	CF-3	1.22	1.83	11	47	42		Till: sand and silt, some gravel, trace clay.
▲	F-16	CF-2	0.61	1.22	15	49	37		Till: silty sand, some gravel, trace clay.
★	F-17	CF-3	1.22	1.83	15	48	37		Till: silty sand, some gravel, trace clay.

**REMARKS :**

**CLIENT** : Tetra-Tech QI Inc.  
**PROJECT** : Replacement of the perimeter fence at the Cowansville Correctional Facility  
**LOCATION** : 400 Fordyce Road, Cowansville, Quebec  
**FILE** : 649001



	Boring and/or Test Pit	Sample	Depth (m)		Gravel (%)	Sand (%)	Silt and Clay (%)		Description
			from	to					
●	F-03	CF-2	0.61	1.22	24	46	30		Till: gravelly and silty sand, trace clay.
☒	F-18	CF-3	1.22	1.83	1	21	63	15	Till: sandy silt, some clay, trace gravel.
▲	F-20	CF-3	1.22	1.83	20	47	34		Till: silty and gravelly sand, trace clay.

**REMARKS :**

## Appendix 4

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Results and Chemical Analyses Certificates

**EXPLANATORY NOTES**  
**CHEMICAL ANALYSIS - SOILS**

---	No analysis carried out.
123	Concentration < or = A criterion or detection limit.
123	Concentration > A criterion and < B criterion.
123	Concentration = B criterion.
123	Concentration > B criterion or < or = C criterion.
123	Concentration > C or < RRBCS value.
123	Concentration = or > RRBCS value.

Note 1 : *Action Guide - Soil Protection and Contaminated Sites Rehabilitation (Action Guide).*

The B and C criteria correspond to the limit values of Schedules I and II of the Regulation Respecting Contaminated Soil Storage and Contaminated Soil Transfer Stations (RRCSSCSTS) and of the Land Protection and Rehabilitation Regulation (LPRR). An asterisk (\*) after the parameter's name indicates a difference in concentrations between those values.

Schedule I limit values of the RRBCS generally correspond to Schedule III limit values of the RRCSSCSTS. Two asterisks (\*\*) after the parameter's name indicates a difference in concentrations between those values.

The A criterion values for metals correspond to those of the Appalachian geological province.

Note 2 : *Regulation Respecting the Burial of Contaminated Soils (RRBCS).*

Note 3 : No existing limit value or criterion.

Table 4-1 : Chemical Analytical Results - Soils (mg/kg) - Action Guide Criteria

Parameters	Action Guide <sup>1</sup>				RRBCS <sup>2</sup> Schedule I	Borehole																
	A	B	C	Schedule I		F-1		F-2			F-3			F-4			F-5		F-6			
						CF-2	CF-4	CF-2	CF-3	CF-4	CF-1	DUP-2	CF-3	CF-1A	CF-1B	CF-3	CF-1B	CF-3	CF-1B	CF-3	CF-1B	CF-3
						0.61-1.22	1.83-2.44	0.61-1.22	1.22-1.83	1.83-2.44	0.03-0.61			1.22-1.83	0.00-0.40	0.40-0.61	1.22-1.83	0.33-0.61	1.22-1.83	0.18-0.61	1.22-1.83	
Fill	Till	Fill	Fill	Peat	Fill			Till	Fill	Topsoil	Sand	Fill	Sand	Fill	Sand							
<b>Total Extractable Metals</b>					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
Silver (Ag)	0.8	20	40	200	<5.0	5.2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	7.4			
Arsenic (As)	19	30	50	250	24	<20	32	34	26	25	22	23	36	37	<20	30	<20	32	194			
Barium (Ba)	350	500	2,000	10,000	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9			
Cadmium (Cd)	1.3	5	20	100	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	17			
Cobalt (Co)	25	50	300	1,500	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45			
Chromium (Cr)	100	250	800	4,000	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40			
Chromium (Cr)	100	250	800	4,000	6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			
Copper (Cu)	65	100	500	2,500	748	609	872	746	657	564	533	1,320	428	321	247	66	117	281	1,780			
Tin (Sn)	5	50	300	1,500	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			
Manganese (Mn)	1,000	1,000	2,200	11,000	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Mercury (Hg)	0.3	2	10	50	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	40			
Molybdenum (Mo)	2	10	40	200	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30			
Nickel (Ni)	50	100	500	2,500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	1.4	<1.0	<1.0	<1.0	<1.0			
Lead (Pb)	40	500	1,000	5,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			
Selenium (Se)	3	3	10	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Zinc (Zn)	140	500	1,500	7,500	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Acenaphthene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Acenaphthylene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Anthracene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (a) anthracene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (a) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (b) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (j) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (k) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (b + j + k) fluoranthene*	. <sup>4</sup>	. <sup>4</sup>	. <sup>4</sup>	136	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (c) phenanthrene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (g,h,i) perylene	0.1	1	10	18	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Chrysene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,h) anthracene	0.1	1	10	82	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,i) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,h) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,l) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dimethyl-7,12 Benzo (a) anthracene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Fluoranthene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Fluorene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Indeno (1,2,3-cd) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Methyl-3 cholanthrene	0.1	1	10	150	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Naphthalene	0.1	5	50	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Phenanthrene	0.1	5	50	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Pyrene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Methyl-2 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Methyl-1 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dimethyl-1,3 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Trimethyl-2,3,5 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
<b>Petroleum Hydrocarbons</b>					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			
PH C <sub>10</sub> -C <sub>20</sub>	300	700	3,500	10,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			



Table 4-1 : Chemical Analytical Results - Soils (mg/kg) - Action Guide Criteria

Parameters	Action Guide <sup>1</sup>				RRBCS <sup>2</sup> Schedule I	Borehole															
	A	B	C	Schedule I		F-7		F-8		F-9		F-10		F-11		F-12		F-13			
						CF-1B	DUP-5	CF-2	CF-3	CF-1	CF-3	CF-1	CF-2	DUP-7	CF-1	CF-3	CF-1	CF-2	CF-1	CF-3	
						0.06-0.61		0.61-1.22	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	0.61-1.22		0.00-0.61	1.22-1.83	0.00-0.45	0.61-0.71	0.00-0.61	1.22-1.83	
Fill		Fill	Sand	Fill	Sand	Fill	Sand		Fill	Sand	Fill	Sand	Fill	Till							
<b>Total Extractable Metals</b>					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
Silver (Ag)	0.8	20	40	200	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0			
Arsenic (As)	19	30	50	250	30	35	48	43	25	26	33	34	26	28	23	39	<20	44	50		
Barium (Ba)	350	500	2,000	10,000	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9		
Cadmium (Cd)	1.3	5	20	100	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15		
Cobalt (Co)	25	50	300	1,500	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45		
Chromium (Cr)	100	250	800	4,000	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40		
Chromium (Cr)	100	250	800	4,000	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
Copper (Cu)	65	100	500	2,500	340	596	531	403	315	144	502	299	218	367	160	389	236	643	834		
Tin (Sn)	5	50	300	1,500	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		
Manganese (Mn)	1,000	1,000	2,200	11,000	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
Mercury (Hg)	0.3	2	10	50	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30		
Molybdenum (Mo)	2	10	40	200	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30		
Nickel (Ni)	50	100	500	2,500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
Lead (Pb)	40	500	1,000	5,000	<100	<100	<100	<100	<100	<100	163	<100	<100	<100	<100	<100	<100	<100	<100		
Selenium (Se)	3	3	10	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Zinc (Zn)	140	500	1,500	7,500	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Acenaphthene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Acenaphthylene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Anthracene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (a) anthracene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (a) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (b) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (j) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (k) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (b + j + k) fluoranthene*	. <sup>4</sup>	. <sup>4</sup>	. <sup>4</sup>	136	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (c) phenanthrene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Benzo (g,h,i) perylene	0.1	1	10	18	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Chrysene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Dibenzo (a,h) anthracene	0.1	1	10	82	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Dibenzo (a,i) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Dibenzo (a,h) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Dibenzo (a,l) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Dimethyl-7,12 Benzo (a) anthracene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Fluoranthene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1		
Fluorene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Indeno (1,2,3-cd) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Methyl-3 cholanthrene	0.1	1	10	150	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Naphthalene	0.1	5	50	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Phenanthrene	0.1	5	50	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Pyrene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Methyl-2 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Methyl-1 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Dimethyl-1,3 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Trimethyl-2,3,5 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
<b>Petroleum Hydrocarbons</b>					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		
PH C <sub>10</sub> -C <sub>20</sub>	300	700	3,500	10,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		

Table 4-1 : Chemical Analytical Results - Soils (mg/kg) - Action Guide Criteria

Parameters	Action Guide <sup>1</sup>				RRBCS <sup>2</sup> Schedule I	Borehole																
	A	B	C	Schedule I		F-14		F-15		F-16		F-17		F-18		F-19		F-20				
						CF-2	CF-3	CF-1	CF-3	CF-1	CF-3	CF-1	CF-3	CF-1	CF-3	CF-1	CF-3	CF-1	DUP-10	CF-3	CF-1	CF-2
						0.61-1.22	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.25		1.22-1.83	0.00-0.61	0.61-1.22
Fill	Sand	Fill	Till	Sand	Till	Fill	Till	Fill	Till	Fill	Sand	Fill		Till	Fill	Till						
<b>Total Extractable Metals</b>					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				
Silver (Ag)	0.8	20	40	200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.6	5.1	<5.0	<5.0	<5.0	5.2	5.6	<5.0				
Arsenic (As)	19	30	50	250	34	42	22	<20	35	33	37	22	37	93	27	31	<20	37	29			
Barium (Ba)	350	500	2,000	10,000	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9			
Cadmium (Cd)	1.3	5	20	100	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15			
Cobalt (Co)	25	50	300	1,500	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45			
Chromium (Cr)	100	250	800	4,000	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40			
Chromium (Cr)	100	250	800	4,000	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			
Copper (Cu)	65	100	500	2,500	574	246	671	468	418	740	549	255	742	1,180	381	455	1,270	746	888			
Tin (Sn)	5	50	300	1,500	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			
Manganese (Mn)	1,000	1,000	2,200	11,000	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Mercury (Hg)	0.3	2	10	50	<30	<30	<30	<30	<30	<30	<30	<30	<30	31	<30	<30	<30	<30	<30			
Molybdenum (Mo)	2	10	40	200	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30			
Nickel (Ni)	50	100	500	2,500	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
Lead (Pb)	40	500	1,000	5,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			
Selenium (Se)	3	3	10	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Zinc (Zn)	140	500	1,500	7,500	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Acenaphthene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Acenaphthylene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Anthracene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (a) anthracene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (a) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (b) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (j) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (k) fluoranthene**	0.1	1	10	. <sup>3</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (b + j + k) fluoranthene*	. <sup>4</sup>	. <sup>4</sup>	. <sup>4</sup>	136	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (c) phenanthrene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Benzo (g,h,i) perylene	0.1	1	10	18	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Chrysene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,h) anthracene	0.1	1	10	82	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,i) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,h) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dibenzo (a,l) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dimethyl-7,12 Benzo (a) anthracene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Fluoranthene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Fluorene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Indeno (1,2,3-cd) pyrene	0.1	1	10	34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Methyl-3 cholanthrene	0.1	1	10	150	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Naphthalene	0.1	5	50	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Phenanthrene	0.1	5	50	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Pyrene**	0.1	10	100	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Methyl-2 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Methyl-1 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Dimethyl-1,3 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Trimethyl-2,3,5 naphthalene	0.1	1	10	56	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
<b>Petroleum Hydrocarbons</b>					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			
PH C <sub>10</sub> -C <sub>20</sub>	300	700	3,500	10,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			

**EXPLANATORY NOTES**  
**CHEMICAL ANALYSES - SOILS**

---	No analysis carried out.
123	Concentration less than the CCME guideline value for residential/parkland or commercial land use, or the detection level.
<b>123</b>	Concentration greater than the CCME guideline value for residential/parkland land use but less than the guideline value for commercial land use.
<b>123</b>	Concentration greater than the CCME guideline value for commercial land use.
<b>123</b>	Concentration greater than the CWS standard for residential/parkland land use.
<b>123</b>	Concentration greater than the CWS standard for commercial land use.

Note 1 : *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* or *Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil* (CWS) published by the Canadian Council of Ministers of the Environment (CCME).

Note 2 : Standards shown are for coarse-grained soils.



Table 4-2 : Chemical Analytical Results - Soils (mg/kg) - CCME Standards

Parameters	Canadian Environmental Quality Guidelines <sup>1</sup>		Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil				F-6		F-7		F-8		F-9		F-10		F-11	
			Tier 1 : Coarse-grained Surface Soils		CF-1B	DUP-5	CF-2	CF-3	CF-1	CF-3	CF-1	DUP-7	CF-1	CF-3				
	Residential / Parkland	Commercial	Residential / Parkland	Commercial	CF-1B	DUP-5	CF-2	CF-3	CF-1	CF-3	CF-1	DUP-7	CF-1	CF-3				
	Description		0.18-0.61	1.22-1.83	0.06-0.61		0.61-1.22	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	0.61-1.22		0.00-0.61	1.22-1.83			
<b>Total Extractable Metals</b>																		
Silver (Ag)	20	40	N/A	N/A	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	12	12	N/A	N/A	<5.0	7.4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Barium (Ba)	500	2,000	N/A	N/A	32	194	30	35	48	43	25	26	33	34	26	28	23	23
Cadmium (Cd)	10	22	N/A	N/A	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Cobalt (Co)	50	300	N/A	N/A	<15	17	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15
Chromium (Cr)	64	87	N/A	N/A	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45
Copper (Cu)	63	91	N/A	N/A	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Tin (Sn)	50	300	N/A	N/A	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Manganese (Mn)	.2	.2	N/A	N/A	281	1,780	340	596	531	403	315	144	502	299	218	367	160	160
Mercury (Hg)	6.6	24	N/A	N/A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum (Mo)	10	40	N/A	N/A	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Nickel (Ni)	50	50	N/A	N/A	<30	40	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Lead (Pb)	140	260	N/A	N/A	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Selenium (Se)	1	2.9	N/A	N/A	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Zinc (Zn)	200	360	N/A	N/A	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
<b>Petroleum Hydrocarbons (PHCs)</b>																		
F <sub>2</sub> (>C <sub>10</sub> - C <sub>16</sub> )	.2	.2	150	260	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
F <sub>3</sub> (C <sub>16</sub> - C <sub>34</sub> )	.2	.2	300	1,700	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	13.8	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
F <sub>4</sub> (>C <sub>34</sub> - C <sub>50</sub> )	.2	.2	2,800	3,300	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>																		
Acenaphthene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) anthracene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) pyrene	0.7	1.4	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (b) fluoranthene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (j) fluoranthene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (k) fluoranthene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (c) phenanthrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (g,h,i) perylene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,h) anthracene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,i) pyrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,h) pyrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,l) pyrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethyl-7,12 Benzo (a) anthracene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno (1,2,3-cd) pyrene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl-3 cholanthrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	0.6	22	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	5	50	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	10	100	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl-2 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl-1 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethyl-1,3 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Trimethyl-2,3,5 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table 4-2 : Chemical Analytical Results - Soils (mg/kg) - CCME Standards

Parameters	Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil				F-12		F-13		F-14		F-15		F-16		F-17		F-18	
	Canadian Environmental Quality Guidelines <sup>1</sup>				CF-1	CF-2	CF-1	CF-3	CF-2	CF-3	CF-1	CF-3	CF-1	CF-3	CF-1	CF-3	CF-1	CF-3
	Tier 1 : Coarse-grained Surface Soils				0.00-0.45	0.61-0.71	0.00-0.61	1.22-1.83	0.61-1.22	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	1.22-1.83	0.00-0.61	1.22-1.83
	Residential / Parkland	Commercial	Residential / Parkland	Commercial	Fill	Sand	Fill	Till	Fill	Sand	Fill	Till	Sand	Till	Fill	Till	Fill	Sand
<b>Total Extractable Metals</b>																		
Silver (Ag)	20	40	N/A	N/A	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Arsenic (As)	12	12	N/A	N/A	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.6	5.1	<5.0	
Barium (Ba)	500	2,000	N/A	N/A	39	<20	44	50	34	42	22	<20	35	33	37	22	37	
Cadmium (Cd)	10	22	N/A	N/A	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	
Cobalt (Co)	50	300	N/A	N/A	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	
Chromium (Cr)	64	87	N/A	N/A	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	
Copper (Cu)	63	91	N/A	N/A	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	
Tin (Sn)	50	300	N/A	N/A	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Manganese (Mn)	.2	.2	N/A	N/A	389	236	643	834	574	246	671	468	418	740	549	255	742	
Mercury (Hg)	6.6	24	N/A	N/A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Molybdenum (Mo)	10	40	N/A	N/A	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Nickel (Ni)	50	50	N/A	N/A	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	
Lead (Pb)	140	260	N/A	N/A	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	
Selenium (Se)	1	2.9	N/A	N/A	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Zinc (Zn)	200	360	N/A	N/A	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
<b>Petroleum Hydrocarbons (PHCs)</b>																		
F <sub>2</sub> (>C <sub>10</sub> - C <sub>16</sub> )	.2	.2	150	260	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
F <sub>3</sub> (C <sub>16</sub> - C <sub>34</sub> )	.2	.2	300	1,700	<10.0	<10.0	<10.0	13.3	<10.0	<10.0	<10.0	<10.0	<10.0	65.7	<10.0	<10.0	<10.0	
F <sub>4</sub> (>C <sub>34</sub> - C <sub>50</sub> )	.2	.2	2,800	3,300	<10.0	<10.0	<10.0	10.4	<10.0	<10.0	<10.0	<10.0	<10.0	27.2	<10.0	<10.0	<10.0	
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>																		
Acenaphthene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Acenaphthylene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Anthracene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (a) anthracene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (a) pyrene	0.7	1.4	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (c) phenanthrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (g,h,i) perylene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Chrysene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo (a,h) anthracene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo (a,i) pyrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo (a,h) pyrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo (a,l) pyrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Dimethyl-7,12 Benzo (a) anthracene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Fluoranthene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Fluorene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Indeno (1,2,3-cd) pyrene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Methyl-3 cholanthrene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Naphthalene	0.6	22	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Phenanthrene	5	50	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Pyrene	10	100	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Methyl-2 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Methyl-1 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Dimethyl-1,3 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Trimethyl-2,3,5 naphthalene	.2	.2	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	

Table 4-2 : Chemical Analytical Results - Soils (mg/kg) - CCME Standards

Borehole Sample Depth (m) Description	F-19			F-20	
	CF-1	DUP-10	CF-3	CF-1	CF-2
	0.00-0.25		1.22-1.83	0.00-0.61	0.61-1.22
	Fill		Till	Fill	Till

Parameters	Canadian Environmental Quality Guidelines <sup>1</sup>		Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil		F-19 CF-1	F-19 DUP-10	F-19 CF-3	F-20 CF-1	F-20 CF-2
	Residential / Parkland	Commercial	Tier 1 : Coarse-grained Surface Soils						
			Residential / Parkland	Commercial					
<b>Total Extractable Metals</b>									
Silver (Ag)	20	40	N/A	N/A	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	12	12	N/A	N/A	<5.0	<5.0	5.2	5.6	<5.0
Barium (Ba)	500	2,000	N/A	N/A	27	31	<20	37	29
Cadmium (Cd)	10	22	N/A	N/A	<0.9	<0.9	<0.9	<0.9	<0.9
Cobalt (Co)	50	300	N/A	N/A	<15	<15	<15	<15	<15
Chromium (Cr)	64	87	N/A	N/A	<45	<45	<45	<45	<45
Copper (Cu)	63	91	N/A	N/A	<40	<40	<40	<40	<40
Tin (Sn)	50	300	N/A	N/A	<5	<5	<5	<5	<5
Manganese (Mn)	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	381	455	1,270	746	888
Mercury (Hg)	6.6	24	N/A	N/A	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum (Mo)	10	40	N/A	N/A	<2	<2	<2	<2	<2
Nickel (Ni)	50	50	N/A	N/A	<30	<30	<30	<30	<30
Lead (Pb)	140	260	N/A	N/A	<30	<30	<30	<30	<30
Selenium (Se)	1	2.9	N/A	N/A	<1.0	<1.0	<1.0	<1.0	<1.0
Zinc (Zn)	200	360	N/A	N/A	<100	<100	<100	<100	<100
<b>Petroleum Hydrocarbons (PHCs)</b>									
F <sub>2</sub> (>C <sub>10</sub> - C <sub>16</sub> )	. <sup>2</sup>	. <sup>2</sup>	150	260	<10.0	<10.0	<10.0	<10.0	<10.0
F <sub>3</sub> (C <sub>16</sub> - C <sub>34</sub> )	. <sup>2</sup>	. <sup>2</sup>	300	1,700	<10.0	<10.0	<10.0	<10.0	<10.0
F <sub>4</sub> (>C <sub>34</sub> - C <sub>50</sub> )	. <sup>2</sup>	. <sup>2</sup>	2,800	3,300	<10.0	<10.0	<10.0	<10.0	<10.0
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>									
Acenaphthene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) anthracene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) pyrene	0.7	1.4	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (b) fluoranthene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (j) fluoranthene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (k) fluoranthene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (c) phenanthrene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (g,h,i) perylene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,h) anthracene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,i) pyrene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,h) pyrene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo (a,l) pyrene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethyl-7,12 Benzo (a) anthracene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno (1,2,3-cd) pyrene	1	10	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl-3 cholanthrene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	0.6	22	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	5	50	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	10	100	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl-2 naphthalene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl-1 naphthalene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethyl-1,3 naphthalene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1
Trimethyl-2,3,5 naphthalene	. <sup>2</sup>	. <sup>2</sup>	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1

**NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC  
275 BENJAMIN-HUDON  
MONTREAL, QC H4N1J1  
(514) 331-6910**

**À L'ATTENTION DE: Pascal Crevier**

**N° DE PROJET: 649001**

**N° BON DE TRAVAIL: 17M264899**

**ANALYSE DES SOLS VÉRIFIÉ PAR: Jalel Rouissi, Chimiste**

**ORGANIQUE DE TRACE VÉRIFIÉ PAR: Robert Roch, Chimiste**

**DATE DU RAPPORT: 2017-10-04**

**VERSION\*: 1**

**NOMBRE DE PAGES: 47**

Si vous désirez de l'information concernant cette analyse, S.V.P. contactez votre chargé de projets au (514) 337-1000.

\*NOTES

**Nous disposerons des échantillons dans les 30 jours suivants les analyses. S.V.P. Contactez le laboratoire si vous désirez avoir un délai d'entreposage.**





NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-01/CF-2	F-01/CF-4	F-02/CF-2	F-02/CF-3	F-03/CF-1
		C / N: A	C / N: B	C / N: C	C / N: D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:					2017-09-11	2017-09-11	2017-09-11	2017-09-11	2017-09-11
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic	mg/kg	6	30	50	250	5.0	<5.0	5.2[<A]	<5.0	<5.0	<5.0
Baryum	mg/kg	340	500	2000	10000	20	24[<A]	<20	32[<A]	34[<A]	25[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	<45
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	<15
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	<40
Étain	mg/kg	5	50	300	1500	5	6[A-B]	<5	<5	<5	<5
Manganèse	mg/kg	1000	1000	2200	11000	10	748[<A]	609[<A]	872[<A]	746[<A]	564[<A]
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	<2
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	<30	<30
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	<30
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	<100

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-03/CF-3	F-04/CF-1A	F-04/CF-3	F-05/CF-1B	F-05/CF-3
		C / N: A	C / N: B	C / N: C	C / N: D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	2017-09-11	2017-09-11	2017-09-11	2017-09-11	2017-09-11
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	
Arsenic	mg/kg	6	30	50	250	5.0	<5.0	<5.0	<5.0	<5.0	
Baryum	mg/kg	340	500	2000	10000	20	23[<A]	36[<A]	<20	30[<A]	
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	
Manganèse	mg/kg	1000	1000	2200	11000	10	1320[B-C]	428[<A]	247[<A]	66[<A]	
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	<30	
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	1.1[A-B]	1.4[A-B]	<1.0	
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-06/CF-1B	F-06/CF-3	F-07/CF-1B	F-08/CF-2	F-08/CF-3
		C / N: A	C / N: B	C / N: C	C / N: D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:					2017-09-11	2017-09-11	2017-09-11	2017-09-12	2017-09-12
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic	mg/kg	6	30	50	250	5.0	<5.0	7.4[A-B]	<5.0	<5.0	<5.0
Baryum	mg/kg	340	500	2000	10000	20	32[<A]	194[<A]	30[<A]	48[<A]	43[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	<45
Cobalt	mg/kg	25	50	300	1500	15	<15	17[<A]	<15	<15	<15
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	<40
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	<5
Manganèse	mg/kg	1000	1000	2200	11000	10	281[<A]	1780[B-C]	340[<A]	531[<A]	403[<A]
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	<2
Nickel	mg/kg	50	100	500	2500	30	<30	40[<A]	<30	<30	<30
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	<30
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	<100

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-09/CF-1	F-09/CF-3	F-10/CF-1	F-10/CF-2	F-11/CF-1
		C / N: A	C / N: B	C / N: C	C / N: D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-12	2017-09-12	2017-09-12	2017-09-12
						8761330	8761333	8761336	8761342	8761343	
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	
Arsenic	mg/kg	6	30	50	250	5.0	<5.0	<5.0	<5.0	<5.0	
Baryum	mg/kg	340	500	2000	10000	20	25[<A]	26[<A]	33[<A]	28[<A]	
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	
Manganèse	mg/kg	1000	1000	2200	11000	10	315[<A]	144[<A]	502[<A]	367[<A]	
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	<30	
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	<1.0	
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	163[A-B]	<100	

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-11/CF-3	F-12/CF-1	F-12/CF-2	F-13/CF-1	F-13/CF-3
		C / N: A	C / N: B	C / N: C	C / N: D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-12	2017-09-12	2017-09-12	2017-09-12
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic	mg/kg	6	30	50	250	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Baryum	mg/kg	340	500	2000	10000	20	23[<A]	39[<A]	<20	44[<A]	50[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	<45
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	<15
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	<40
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	<5
Manganèse	mg/kg	1000	1000	2200	11000	10	160[<A]	389[<A]	236[<A]	643[<A]	834[<A]
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	<2
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	<30	<30
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	<30
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	<100

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-14/CF-2	F-15/CF-1	F-15/CF-3	F-16/CF-1	F-16/CF-3
		C / N: A	C / N: B	C / N: C	C / N: D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-13	2017-09-13	2017-09-13	2017-09-13
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	
Arsenic	mg/kg	6	30	50	250	5.0	<5.0	<5.0	<5.0	<5.0	
Baryum	mg/kg	340	500	2000	10000	20	34[<A]	22[<A]	<20	35[<A]	33[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	
Manganèse	mg/kg	1000	1000	2200	11000	10	574[<A]	671[<A]	468[<A]	418[<A]	740[<A]
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	<30	
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	<1.0	
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-17/CF-1	F-17/CF-3	F-18/CF-1	F-18/CF-3	F-19/CF-1
		C / N: A	C / N: B	C / N: C	C / N: D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:					2017-09-13	2017-09-13	2017-09-13	2017-09-13	2017-09-13
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	
Arsenic	mg/kg	6	30	50	250	5.0	5.6[<A]	5.1[<A]	<5.0	<5.0	
Baryum	mg/kg	340	500	2000	10000	20	37[<A]	22[<A]	37[<A]	93[<A]	
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	
Manganèse	mg/kg	1000	1000	2200	11000	10	549[<A]	255[<A]	742[<A]	1180[B-C]	
Mercur	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	31[<A]	
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	<1.0	
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					LDR	F-19/CF-3	F-20/CF-1	F-20/CF-2	DUP-2	DUP-5
		C / N: A	C / N: B	C / N: C	C / N: D	MATRICE:		Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:						2017-09-13	2017-09-13	2017-09-13	2017-09-11	2017-09-11
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Arsenic	mg/kg	6	30	50	250	5.0	5.2[<A]	5.6[<A]	<5.0	<5.0	<5.0	
Baryum	mg/kg	340	500	2000	10000	20	<20	37[<A]	29[<A]	22[<A]	35[<A]	
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	<0.9	
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	<45	
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	<15	
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	<40	
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	<5	
Manganèse	mg/kg	1000	1000	2200	11000	10	1270[B-C]	746[<A]	888[<A]	533[<A]	596[<A]	
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	<2	
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	<30	<30	
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	<30	
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	<100	

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDELCC.





NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:						DUP-7	DUP-10	F-04/CF-1B	F14/CF-3
		C / N : A		C / N : B		C / N : C		C / N : D		LDR	
		MATRICE:	DATE D'ÉCHANTILLONNAGE:		2017-09-12	2017-09-13	2017-09-11	2017-09-12	8761438	8761440	8761442
Argent	mg/kg	2	20	40	200	0.5	<0.5	<0.5	<0.5	<0.5	
Arsenic	mg/kg	6	30	50	250	5.0	<5.0	<5.0	<5.0	<5.0	
Baryum	mg/kg	340	500	2000	10000	20	26[<A]	31[<A]	37[<A]	42[<A]	
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9	<0.9	<0.9	<0.9	
Chrome	mg/kg	100	250	800	4000	45	<45	<45	<45	<45	
Cobalt	mg/kg	25	50	300	1500	15	<15	<15	<15	<15	
Cuivre	mg/kg	50	100	500	2500	40	<40	<40	<40	<40	
Étain	mg/kg	5	50	300	1500	5	<5	<5	<5	<5	
Manganèse	mg/kg	1000	1000	2200	11000	10	218[<A]	455[<A]	321[<A]	246[<A]	
Mercuré	mg/kg	0.2	2	10	50	0.2	<0.2	<0.2	<0.2	<0.2	
Molybdène	mg/kg	2	10	40	200	2	<2	<2	<2	<2	
Nickel	mg/kg	50	100	500	2500	30	<30	<30	<30	<30	
Plomb	mg/kg	50	500	1000	5000	30	<30	<30	<30	<30	
Sélénium	mg/kg	1	3	10	50	1.0	<1.0	<1.0	<1.0	1.1[A-B]	
Zinc	mg/kg	140	500	1500	7500	100	<100	<100	<100	<100	

**Commentaires:** LDR - Limite de détection rapportée; C / N - Critères Normes: A se réfère QC PTC 2016 A, B se réfère QC PTC 2016 B, C se réfère QC PTC 2016 C, D se réfère QC RESC (Annexe 1)  
Les valeurs des critères sont uniquement fournies comme référence générale. Les critères fournis peuvent être ou ne pas être pertinents pour l'utilisation prévue. Se référer directement à la norme applicable pour l'interprétation réglementaire.

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-01/CF-2	F-01/CF-4	F-02/CF-2	F-02/CF-3	F-03/CF-1
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi	Soi
							2017-09-11	2017-09-11	2017-09-11	2017-09-11	2017-09-11
						8761119	8761147	8761148	8761161	8761173	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Humidité	%					0.1	11.9	8.6	10.8	21.3	

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
ST. LAURENT, QUEBEC  
CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Étalon de recouvrement	Unités	Limites	IDENTIFICATION DE L'ÉCHANTILLON:				
			F-01/CF-2	F-01/CF-4	F-02/CF-2	F-02/CF-3	F-03/CF-1
			MATRICE: Sol				
			DATE D'ÉCHANTILLONNAGE: 2017-09-11				
			8761119	8761147	8761148	8761161	8761173
Acénaphthène-D10	%	40-140	99	96	101	95	98
Fluoranthène-D10	%	40-140	97	68	93	95	95
Pérylène-D12	%	40-140	88	NA	91	90	86

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

IDENTIFICATION DE L'ÉCHANTILLON:

F-03/CF-3

F-04/CF-1A

F-04/CF-3

F-05/CF-1B

F-05/CF-3

MATRICE:

Sol

Sol

Sol

Sol

Sol

DATE D'ÉCHANTILLONNAGE:

2017-09-11

2017-09-11

2017-09-11

2017-09-11

2017-09-11

Paramètre	Unités	C / N : A	C / N : B	C / N : C	C / N : D	LDR	8761249	8761263	8761272	8761281	8761289
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Humidité	%					0.1	7.4	13.8	18.1	28.0	19.4

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
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CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					
		F-03/CF-3	F-04/CF-1A	F-04/CF-3	F-05/CF-1B	F-05/CF-3	
		MATRICE: Sol					
		DATE D'ÉCHANTILLONNAGE: 2017-09-11					
Étalon de recouvrement	Unités	Limites	8761249	8761263	8761272	8761281	8761289
Acénaphthène-D10	%	40-140	98	101	102	101	101
Fluoranthène-D10	%	40-140	74	94	98	92	92
Pérylène-D12	%	40-140	NA	85	81	87	49

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-06/CF-1B	F-06/CF-3	F-07/CF-1B	F-08/CF-2	F-08/CF-3
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi	Soi
							DATE D'ÉCHANTILLONNAGE:	2017-09-11	2017-09-11	2017-09-11	2017-09-12
						8761291	8761298	8761309	8761320	8761329	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Humidité	%					0.1	17.3	24.6	14.1	14.6	16.9

Certifié par:



Robert Roch

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## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
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TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					
		F-06/CF-1B	F-06/CF-3	F-07/CF-1B	F-08/CF-2	F-08/CF-3	
		MATRICE: Sol					
		DATE D'ÉCHANTILLONNAGE:					
		2017-09-11	2017-09-11	2017-09-11	2017-09-12	2017-09-12	
Étalon de recouvrement	Unités	Limites	8761291	8761298	8761309	8761320	8761329
Acénaphthène-D10	%	40-140	102	97	103	102	103
Fluoranthène-D10	%	40-140	97	94	98	98	99
Pérylène-D12	%	40-140	89	85	89	88	83

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-09/CF-1	F-09/CF-3	F-10/CF-1	F-10/CF-2	F-11/CF-1
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-12	2017-09-12	2017-09-12	2017-09-12
						8761330	8761333	8761336	8761342	8761343	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Humidité	%					0.1	13.7	20.3	22.2	19.8	18.5

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.





## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
ST. LAURENT, QUEBEC  
CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					
		F-09/CF-1	F-09/CF-3	F-10/CF-1	F-10/CF-2	F-11/CF-1	
		MATRICE: Sol					
		DATE D'ÉCHANTILLONNAGE: 2017-09-12					
Étalon de recouvrement	Unités	Limites	8761330	8761333	8761336	8761342	8761343
Acénaphthène-D10	%	40-140	103	104	102	100	109
Fluoranthène-D10	%	40-140	95	98	97	99	100
Pérylène-D12	%	40-140	91	69	90	85	91

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-11/CF-3	F-12/CF-1	F-12/CF-2	F-13/CF-1	F-13/CF-3
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi	Soi
							2017-09-12	2017-09-12	2017-09-12	2017-09-12	2017-09-12
						8761344	8761346	8761348	8761349	8761350	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	0.1[A]	
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Humidité	%					0.1	21.1	19.7	20.8	15.3	

Certifié par:



Robert Roch

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## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
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CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					
		F-11/CF-3	F-12/CF-1	F-12/CF-2	F-13/CF-1	F-13/CF-3	
		MATRICE: Sol					
		DATE D'ÉCHANTILLONNAGE: 2017-09-12					
Étalon de recouvrement	Unités	Limites	8761344	8761346	8761348	8761349	8761350
Acénaphthène-D10	%	40-140	109	102	97	93	99
Fluoranthène-D10	%	40-140	100	97	110	111	112
Pérylène-D12	%	40-140	81	88	87	90	94

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-14/CF-2	F-15/CF-1	F-15/CF-3	F-16/CF-1	F-16/CF-3
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi	Soi
							2017-09-12	2017-09-13	2017-09-13	2017-09-13	2017-09-13
						8761351	8761354	8761355	8761357	8761359	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Humidité	%					0.1	16.3	11.2	13.5	12.8	

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
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CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					
		F-14/CF-2	F-15/CF-1	F-15/CF-3	F-16/CF-1	F-16/CF-3	
		MATRICE: Sol					
		DATE D'ÉCHANTILLONNAGE:					
		2017-09-12	2017-09-13	2017-09-13	2017-09-13	2017-09-13	
		8761351	8761354	8761355	8761357	8761359	
Étalon de recouvrement	Unités	Limites					
Acénaphthène-D10	%	40-140	95	95	95	94	86
Fluoranthène-D10	%	40-140	112	112	112	112	111
Pérylène-D12	%	40-140	90	87	87	91	93

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-17/CF-1	F-17/CF-3	F-18/CF-1	F-18/CF-3	F-19/CF-1
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi	Soi
							2017-09-13	2017-09-13	2017-09-13	2017-09-13	2017-09-13
						8761361	8761363	8761374	8761377	8761378	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Humidité	%					0.1	18.8	12.0	16.3	17.0	

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
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FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					
		F-17/CF-1	F-17/CF-3	F-18/CF-1	F-18/CF-3	F-19/CF-1	
		MATRICE: Sol					
		DATE D'ÉCHANTILLONNAGE: 2017-09-13					
Étalon de recouvrement	Unités	Limites	8761361	8761363	8761374	8761377	8761378
Acénaphthène-D10	%	40-140	91	97	97	97	86
Fluoranthène-D10	%	40-140	105	115	111	113	106
Pérylène-D12	%	40-140	84	87	89	88	86

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					F-19/CF-3	F-20/CF-1	F-20/CF-2	DUP-2	DUP-5
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi	Soi
		DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	DATE D'ÉCHANTILLONNAGE:	2017-09-13	2017-09-13	2017-09-13	2017-09-11	2017-09-11
						8761384	8761388	8761431	8761434	8761436	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	<0.1	
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	<0.1	
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	<0.1	
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	<0.1	
Humidité	%					0.1	10.7	8.9	12.3	9.1	14.1

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.





## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
ST. LAURENT, QUEBEC  
CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Étalon de recouvrement	Unités	LIMITES	IDENTIFICATION DE L'ÉCHANTILLON:				
			F-19/CF-3	F-20/CF-1	F-20/CF-2	DUP-2	DUP-5
DATE D'ÉCHANTILLONNAGE:			2017-09-13	2017-09-13	2017-09-13	2017-09-11	2017-09-11
MATRICE:			Soi	Soi	Soi	Soi	Soi
8761384			8761388	8761431	8761434	8761436	8761436
Acénaphthène-D10	%	40-140	100	94	91	92	94
Fluoranthène-D10	%	40-140	113	113	108	109	112
Pérylène-D12	%	40-140	81	85	74	78	88

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:					DUP-7	DUP-10	F-04/CF-1B	F14/CF-3
		C / N : A	C / N : B	C / N : C	C / N : D	LDR	Soi	Soi	Soi	Soi
							2017-09-12	2017-09-13	2017-09-11	2017-09-12
						8761438	8761440	8761442	8761546	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1	<0.1	<0.1	
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1	<0.1	<0.1	
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1	<0.1	<0.1	
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1	<0.1	<0.1	
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1	<0.1	<0.1	
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1	<0.1	<0.1	
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1	<0.1	<0.1	
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1	<0.1	<0.1	
Humidité	%					0.1	20.3	18.1	14.6	18.3

Certifié par:



Robert Roch

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## Certificat d'analyse

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
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CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Étalon de recouvrement	Unités	Limites	IDENTIFICATION DE L'ÉCHANTILLON:				
			DUP-7	DUP-10	F-04/CF-1B	F14/CF-3	
			MATRICE:	Soi	Soi	Soi	Soi
			DATE D'ÉCHANTILLONNAGE:	2017-09-12	2017-09-13	2017-09-11	2017-09-12
			8761438	8761440	8761442	8761546	
Acénaphthène-D10	%	40-140	96	92	92	95	
Fluoranthène-D10	%	40-140	110	112	113	118	
Pérylène-D12	%	40-140	84	92	90	89	

**Commentaires:** LDR - Limite de détection rapportée; C / N - Critères Normes: A se réfère QC PTC 2016 A, B se réfère QC PTC 2016 B, C se réfère QC PTC 2016 C, D se réfère QC RESC (Annexe 1)  
Les valeurs des critères sont uniquement fournies comme référence générale. Les critères fournis peuvent être ou ne pas être pertinents pour l'utilisation prévue. Se référer directement à la norme applicable pour l'interprétation réglementaire.

**8761147** Un des pourcentages de récupération n'est pas applicable en raison d'une interférence de matrice.

**8761249** Un des pourcentages de récupération n'est pas applicable en raison d'une interférence de matrice.

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers C10-C50 (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

IDENTIFICATION DE L'ÉCHANTILLON:							F-01/CF-2	F-01/CF-4	F-02/CF-2	F-02/CF-3	F-03/CF-1
MATRICE:							Sol	Sol	Sol	Sol	Sol
DATE D'ÉCHANTILLONNAGE:							2017-09-11	2017-09-11	2017-09-11	2017-09-11	2017-09-11
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761119	8761147	8761148	8761161	8761173
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100
Humidité	%					0.1	11.9	8.6	10.8	21.3	11.1
<b>Étalon de recouvrement</b>	<b>Unités</b>					<b>Limites</b>					
Nonane	%			40-140			81	77	79	81	80
IDENTIFICATION DE L'ÉCHANTILLON:							F-03/CF-3	F-04/CF-1A	F-04/CF-3	F-05/CF-1B	F-05/CF-3
MATRICE:							Sol	Sol	Sol	Sol	Sol
DATE D'ÉCHANTILLONNAGE:							2017-09-11	2017-09-11	2017-09-11	2017-09-11	2017-09-11
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761249	8761263	8761272	8761281	8761289
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100
Humidité	%					0.1	7.4	13.8	18.1	28.0	19.4
<b>Étalon de recouvrement</b>	<b>Unités</b>					<b>Limites</b>					
Nonane	%			40-140			78	80	79	78	81
IDENTIFICATION DE L'ÉCHANTILLON:							F-06/CF-1B	F-06/CF-3	F-07/CF-1B	F-08/CF-2	F-08/CF-3
MATRICE:							Sol	Sol	Sol	Sol	Sol
DATE D'ÉCHANTILLONNAGE:							2017-09-11	2017-09-11	2017-09-11	2017-09-12	2017-09-12
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761291	8761298	8761309	8761320	8761329
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100
Humidité	%					0.1	17.3	24.6	14.1	14.6	16.9
<b>Étalon de recouvrement</b>	<b>Unités</b>					<b>Limites</b>					
Nonane	%			40-140			79	79	81	80	80

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers C10-C50 (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					F-09/CF-1	F-09/CF-3	F-10/CF-1	F-10/CF-2	F-11/CF-1
		MATRICE:					Sol	Sol	Sol	Sol	Sol
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-12	2017-09-12	2017-09-12	2017-09-12
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761330	8761333	8761336	8761342	8761343
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100
Humidité	%					0.1	13.7	20.3	22.2	19.8	18.5
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>									
Nonane	%			40-140			82	79	82	80	83
		IDENTIFICATION DE L'ÉCHANTILLON:					F-11/CF-3	F-12/CF-1	F-12/CF-2	F-13/CF-1	F-13/CF-3
		MATRICE:					Sol	Sol	Sol	Sol	Sol
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-12	2017-09-12	2017-09-12	2017-09-12
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761344	8761346	8761348	8761349	8761350
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100
Humidité	%					0.1	21.1	19.7	20.8	11.8	15.3
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>									
Nonane	%			40-140			80	82	86	86	91
		IDENTIFICATION DE L'ÉCHANTILLON:					F-14/CF-2	F-15/CF-1	F-15/CF-3	F-16/CF-1	F-16/CF-3
		MATRICE:					Sol	Sol	Sol	Sol	Sol
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-13	2017-09-13	2017-09-13	2017-09-13
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761351	8761354	8761355	8761357	8761359
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100
Humidité	%					0.1	16.3	11.2	13.5	13.8	12.8
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>									
Nonane	%			40-140			88	87	89	87	77

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers C10-C50 (sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

							IDENTIFICATION DE L'ÉCHANTILLON:					
							F-17/CF-1	F-17/CF-3	F-18/CF-1	F-18/CF-3	F-19/CF-1	
							MATRICE:	Soi	Soi	Soi	Soi	Soi
							DATE D'ÉCHANTILLONNAGE:	2017-09-13	2017-09-13	2017-09-13	2017-09-13	2017-09-13
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761361	8761363	8761374	8761377	8761378	
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100	
Humidité	%					0.1	18.8	12.0	16.3	19.3	17.0	
<b>Étalon de recouvrement</b>	<b>Unités</b>						<b>Limites</b>					
Nonane	%						40-140	83	91	93	91	81
							IDENTIFICATION DE L'ÉCHANTILLON:					
							F-19/CF-3	F-20/CF-1	F-20/CF-2	DUP-2	DUP-5	
							MATRICE:	Soi	Soi	Soi	Soi	Soi
							DATE D'ÉCHANTILLONNAGE:	2017-09-13	2017-09-13	2017-09-13	2017-09-11	2017-09-11
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761384	8761388	8761431	8761434	8761436	
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100	<100	
Humidité	%					0.1	10.7	8.9	12.3	9.1	14.1	
<b>Étalon de recouvrement</b>	<b>Unités</b>						<b>Limites</b>					
Nonane	%						40-140	90	88	79	78	86
							IDENTIFICATION DE L'ÉCHANTILLON:					
							DUP-7	DUP-10	F-04/CF-1B	F14/CF-3		
							MATRICE:	Soi	Soi	Soi	Soi	
							DATE D'ÉCHANTILLONNAGE:	2017-09-12	2017-09-13	2017-09-11	2017-09-12	
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761438	8761440	8761442	8761546		
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100	<100	<100	<100		
Humidité	%					0.1	20.3	18.1	14.6	18.3		
<b>Étalon de recouvrement</b>	<b>Unités</b>						<b>Limites</b>					
Nonane	%						40-140	88	88	87	88	

**Commentaires:** LDR - Limite de détection rapportée; C / N - Critères Normes: A se réfère QC PTC 2016 A, B se réfère QC PTC 2016 B, C se réfère QC PTC 2016 C, D se réfère QC RESC (Annexe 1)  
Les valeurs des critères sont uniquement fournies comme référence générale. Les critères fournis peuvent être ou ne pas être pertinents pour l'utilisation prévue. Se référer directement à la norme applicable pour l'interprétation réglementaire.

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	C / N: A	C / N: B	IDENTIFICATION DE L'ÉCHANTILLON:		F-01/CF-2	F-01/CF-4	F-02/CF-2	F-02/CF-3	F-03/CF-1	
				MATRICE:		Soi	Soi	Soi	Soi	Soi	
				DATE D'ÉCHANTILLONNAGE:		2017-09-11	2017-09-11	2017-09-11	2017-09-11	2017-09-11	
				C / N: C	C / N: D	LDR	8761119	8761147	8761148	8761161	8761173
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	12.0	<10.0
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	12.3	18.3	<10.0
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA
% Humidité	%					0.2	11.0	8.2	10.0	22.5	9.9
<b>Étalon de recouvrement</b>	<b>Unités</b>					<b>Limites</b>					
Rec. Nonane (F2-F4)	%					40-140	94	96	92	92	96
Paramètre	Unités	C / N: A	C / N: B	IDENTIFICATION DE L'ÉCHANTILLON:		F-03/CF-3	F-04/CF-1A	F-04/CF-3	F-05/CF-1B	F-05/CF-3	
				MATRICE:		Soi	Soi	Soi	Soi	Soi	
				DATE D'ÉCHANTILLONNAGE:		2017-09-11	2017-09-11	2017-09-11	2017-09-11	2017-09-11	
				C / N: C	C / N: D	LDR	8761249	8761263	8761272	8761281	8761289
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA
% Humidité	%					0.2	7.2	13.0	19.7	30.6	19.0
<b>Étalon de recouvrement</b>	<b>Unités</b>					<b>Limites</b>					
Rec. Nonane (F2-F4)	%					40-140	92	98	92	93	88

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

							IDENTIFICATION DE L'ÉCHANTILLON: F-06/CF-1B				
							F-06/CF-3				
							F-07/CF-1B				
							F-08/CF-2				
							F-08/CF-3				
							MATRICE: Sol				
							DATE D'ÉCHANTILLONNAGE: 2017-09-11				
							2017-09-11				
							2017-09-11				
							2017-09-12				
							2017-09-12				
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761291	8761298	8761309	8761320	8761329
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA
% Humidité	%					0.2	9.7	19.2	13.9	15.6	17.5
<b>Étalon de recouvrement</b>	<b>Unités</b>				<b>Limites</b>						
Rec. Nonane (F2-F4)	%				40-140		94	95	99	91	70
							IDENTIFICATION DE L'ÉCHANTILLON: F-09/CF-1				
							F-09/CF-3				
							F-10/CF-1				
							F-10/CF-2				
							F-11/CF-1				
							MATRICE: Sol				
							DATE D'ÉCHANTILLONNAGE: 2017-09-12				
							2017-09-12				
							2017-09-12				
							2017-09-12				
							2017-09-12				
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761330	8761333	8761336	8761342	8761343
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
C>16-C34 (F3)	mg/kg					10.0	13.8	<10.0	<10.0	<10.0	<10.0
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA
% Humidité	%					0.2	14.8	19.0	22.8	19.3	17.9
<b>Étalon de recouvrement</b>	<b>Unités</b>				<b>Limites</b>						
Rec. Nonane (F2-F4)	%				40-140		95	87	97	94	96

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					F-11/CF-3	F-12/CF-1	F-12/CF-2	F-13/CF-1	F-13/CF-3	
		MATRICE:					Soi	Soi	Soi	Soi	Soi	
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-12	2017-09-12	2017-09-12	2017-09-12	
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761344	8761346	8761348	8761349	8761350	
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	13.3	
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	10.4	
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA	
% Humidité	%					0.2	18.6	24.7	20.5	13.5	15.5	
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>										
Rec. Nonane (F2-F4)	%	40-140						94	100	95	100	97
		IDENTIFICATION DE L'ÉCHANTILLON:					F-14/CF-2	F-15/CF-1	F-15/CF-3	F-16/CF-1	F-16/CF-3	
		MATRICE:					Soi	Soi	Soi	Soi	Soi	
		DATE D'ÉCHANTILLONNAGE:					2017-09-12	2017-09-13	2017-09-13	2017-09-13	2017-09-13	
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761351	8761354	8761355	8761357	8761359	
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	65.7	
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	27.2	
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA	
% Humidité	%					0.2	18.4	10.0	13.7	17.6	11.4	
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>										
Rec. Nonane (F2-F4)	%	40-140						96	98	81	102	98

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

		IDENTIFICATION DE L'ÉCHANTILLON:					F-17/CF-1	F-17/CF-3	F-18/CF-1	F-18/CF-3	F-19/CF-1	
		MATRICE:					Soi	Soi	Soi	Soi	Soi	
		DATE D'ÉCHANTILLONNAGE:					2017-09-13	2017-09-13	2017-09-13	2017-09-13	2017-09-13	
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761361	8761363	8761374	8761377	8761378	
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA	
% Humidité	%					0.2	18.2	9.4	16.0	19.7	17.3	
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>										
Rec. Nonane (F2-F4)	%	40-140						91	97	102	94	100
		IDENTIFICATION DE L'ÉCHANTILLON:					F-19/CF-3	F-20/CF-1	F-20/CF-2	DUP-2	DUP-5	
		MATRICE:					Soi	Soi	Soi	Soi	Soi	
		DATE D'ÉCHANTILLONNAGE:					2017-09-13	2017-09-13	2017-09-13	2017-09-11	2017-09-11	
Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	LDR	8761384	8761388	8761431	8761434	8761436	
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	<10.0	<10.0	
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	NA	NA	
% Humidité	%					0.2	9.4	12.9	9.6	9.3	13.7	
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>										
Rec. Nonane (F2-F4)	%	40-140						99	80	104	101	104

Certifié par:



Robert Roch

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NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D. Désaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)

DATE DE RÉCEPTION: 2017-09-27

DATE DU RAPPORT: 2017-10-04

Paramètre	Unités	IDENTIFICATION DE L'ÉCHANTILLON:				LDR	DUP-7	DUP-10	F-04/CF-1B	F14/CF-3
		MATRICE:					Soi	Soi	Soi	Soi
		C / N: A	C / N: B	C / N: C	C / N: D		2017-09-12	2017-09-13	2017-09-11	2017-09-12
C>10-C16 (F2)	mg/kg					10.0	<10.0	<10.0	<10.0	
C>16-C34 (F3)	mg/kg					10.0	<10.0	<10.0	<10.0	
C>34-C50 (F4)	mg/kg					10.0	<10.0	<10.0	<10.0	
Hydrocarbures lourds par gravimétrie (F4G-sg)	mg/kg					300	NA	NA	NA	
% Humidité	%					0.2	19.1	17.9	23.3	
<b>Étalon de recouvrement</b>	<b>Unités</b>	<b>Limites</b>								
Rec. Nonane (F2-F4)	%	40-140					95	104	110	96

**Commentaires:** LDR - Limite de détection rapportée; C / N - Critères Normes: A se réfère QC PTC (Critère A), B se réfère QC PTC (Critère B), C se réfère QC PTC (Critère C), D se réfère QC RESC (Annexe 1)  
Les valeurs des critères sont uniquement fournies comme référence générale. Les critères fournis peuvent être ou ne pas être pertinents pour l'utilisation prévue. Se référer directement à la norme applicable pour l'interprétation réglementaire.

**8761119-8761546** Les résultats sont exprimés sur une base sèche.

Les Fractions F2, F3 et F4 sont quantifiées en fonction des facteurs de réponse moyens des alcanes nC10, nC16 et nC34. Le facteur de réponse de l'alcane nC50 ne dépasse pas 30% d'écart du facteur de réponse moyen des alcanes nC10, nC16 et nC34. Les facteurs de réponse des alcanes nC10, nC16 et nC34 ne varient pas plus de 10 % d'écart des uns des autres.

Le domaine de linéarité respecte un écart maximal de 15%.

Le tracé du chromatogramme est revenu à la ligne de base avant le temps de rétention de l'alcane nC50. Dans le cas contraire l'analyse de la Fraction F4G-sg a été effectuée.

La Fraction F4G-sg présente les hydrocarbures lourds analysés par gravimétrie après traitement au gel de silice.

Le résultat des hydrocarbures lourds ne peut pas être ajouté aux résultats des hydrocarbures C6 à C50.

Les résultats des contrôles de qualité sont disponibles dans la section «Contrôle de qualité» du certificat d'analyse.

Le délai de conservation pour l'extraction et l'analyse a été respecté.

Certifié par:



Robert Roch

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## Contrôle de qualité

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

À L'ATTENTION DE: Pascal Crevier

PRÉLEVÉ PAR: D. Désaulniers

LIEU DE PRÉLÈVEMENT:

### Analyse des Sols

Date du rapport: 2017-10-04

PARAMÈTRE			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ		
Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
							Inf.	Sup.		Inf.	Sup.		Inf.	Sup.

**Métaux Extractibles Totaux (sol) PRTC**

Argent	8765422		<0.5	<0.5	NA	< 0.5	109%	80%	120%	104%	80%	120%	113%	80%	120%
Arsenic	8765422		<5.0	<5.0	NA	< 5.0	101%	80%	120%	96%	80%	120%	104%	80%	120%
Baryum	8765422		86	85	NA	< 20	NA	80%	120%	104%	80%	120%	119%	80%	120%
Cadmium	8765422		<0.9	<0.9	NA	< 0.9	108%	80%	120%	109%	80%	120%	113%	80%	120%
Chrome	8765422		<45	<45	NA	< 45	96%	80%	120%	107%	80%	120%	106%	80%	120%
Cobalt	8765422		<15	<15	NA	< 15	96%	80%	120%	104%	80%	120%	108%	80%	120%
Cuivre	8765422		<40	<40	NA	< 40	108%	80%	120%	104%	80%	120%	110%	80%	120%
Étain	8765422		<5	<5	NA	< 5	96%	80%	120%	100%	80%	120%	NA	80%	120%
Manganèse	8765422		155	144	7.4	< 10	93%	80%	120%	109%	80%	120%	111%	80%	120%
Mercure	8767870		< 0.2	< 0.2	0.0	< 0.2	NA	80%	120%	103%	80%	120%	NA	80%	120%
Molybdène	8765422		<2	<2	NA	< 2	103%	80%	120%	109%	80%	120%	117%	80%	120%
Nickel	8765422		<30	<30	NA	< 30	99%	80%	120%	111%	80%	120%	111%	80%	120%
Plomb	8765422		<30	<30	NA	< 30	107%	80%	120%	106%	80%	120%	98%	80%	120%
Sélénium	8765422		<1.0	<1.0	NA	< 1.0	97%	80%	120%	99%	80%	120%	75%	80%	120%
Zinc	8765422		<100	<100	NA	< 100	100%	80%	120%	114%	80%	120%	110%	80%	120%

**Métaux Extractibles Totaux (sol) PRTC**

Argent	8761263	8761263	<0.5	<0.5	NA	< 0.5	102%	80%	120%	103%	80%	120%	99%	80%	120%
Arsenic	8761263	8761263	<5.0	<5.0	NA	< 5.0	93%	80%	120%	103%	80%	120%	93%	80%	120%
Baryum	8761263	8761263	36	44	NA	< 20	86%	80%	120%	96%	80%	120%	99%	80%	120%
Cadmium	8761263	8761263	<0.9	<0.9	NA	< 0.9	95%	80%	120%	96%	80%	120%	96%	80%	120%
Chrome	8761263	8761263	<45	<45	NA	< 45	102%	80%	120%	94%	80%	120%	90%	80%	120%
Cobalt	8761263	8761263	<15	<15	NA	< 15	105%	80%	120%	97%	80%	120%	97%	80%	120%
Cuivre	8761263	8761263	<40	<40	NA	< 40	102%	80%	120%	95%	80%	120%	92%	80%	120%
Étain	8761263	8761263	<5	<5	NA	< 5	103%	80%	120%	92%	80%	120%	NA	80%	120%
Manganèse	8761263	8761263	428	492	14.1	< 10	101%	80%	120%	96%	80%	120%	91%	80%	120%
Molybdène	8761263	8761263	<2	<2	NA	< 2	109%	80%	120%	100%	80%	120%	103%	80%	120%
Nickel	8761263	8761263	<30	<30	NA	< 30	103%	80%	120%	99%	80%	120%	93%	80%	120%
Plomb	8761263	8761263	<30	<30	NA	< 30	100%	80%	120%	92%	80%	120%	91%	80%	120%
Sélénium	8761263	8761263	1.1	<1.0	NA	< 1.0	81%	80%	120%	80%	80%	120%	NA	80%	120%
Zinc	8761263	8761263	<100	<100	NA	< 100	104%	80%	120%	100%	80%	120%	90%	80%	120%

**Métaux Extractibles Totaux (sol) PRTC**

Mercure	8756308		<0.2	<0.2	NA	< 0.2	NA	80%	120%	84%	80%	120%	88%	80%	120%
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**Métaux Extractibles Totaux (sol) PRTC**

Argent	8761351	8761351	<0.5	<0.5	NA	< 0.5	101%	80%	120%	101%	80%	120%	104%	80%	120%
Arsenic	8761351	8761351	<5.0	<5.0	NA	< 5.0	94%	80%	120%	95%	80%	120%	97%	80%	120%
Baryum	8761351	8761351	34	35	NA	< 20	81%	80%	120%	97%	80%	120%	94%	80%	120%
Cadmium	8761351	8761351	<0.9	<0.9	NA	< 0.9	100%	80%	120%	101%	80%	120%	112%	80%	120%
Chrome	8761351	8761351	<45	<45	NA	< 45	99%	80%	120%	101%	80%	120%	107%	80%	120%
Cobalt	8761351	8761351	<15	<15	NA	< 15	104%	80%	120%	101%	80%	120%	115%	80%	120%
Cuivre	8761351	8761351	<40	<40	NA	< 40	102%	80%	120%	94%	80%	120%	109%	80%	120%
Étain	8761351	8761351	<5	<5	NA	< 5	101%	80%	120%	96%	80%	120%	NA	80%	120%

## Contrôle de qualité

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

À L'ATTENTION DE: Pascal Crevier

PRÉLEVÉ PAR: D. Désaulniers

LIEU DE PRÉLÈVEMENT:

### Analyse des Sols (Suite)

Date du rapport: 2017-10-04			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ			
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.
Manganèse	8761351	8761351	574	637	10.4	< 10	102%	80%	120%	103%	80%	120%	80%	80%	120%
Molybdène	8761351	8761351	<2	<2	NA	< 2	110%	80%	120%	105%	80%	120%	NA	80%	120%
Nickel	8761351	8761351	<30	<30	NA	< 30	101%	80%	120%	104%	80%	120%	110%	80%	120%
Plomb	8761351	8761351	<30	<30	NA	< 30	101%	80%	120%	99%	80%	120%	111%	80%	120%
Sélénium	8761351	8761351	<1.0	<1.0	NA	< 1.0	106%	80%	120%	97%	80%	120%	83%	80%	120%
Zinc	8761351	8761351	<100	<100	NA	< 100	107%	80%	120%	106%	80%	120%	113%	80%	120%
<b>Métaux Extractibles Totaux (sol) PRTC</b>															
Mercuré	8761431	8761431	<0.2	<0.2	NA	< 0.2	111%	80%	120%	92%	80%	120%	NA	80%	120%

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.

## Contrôle de qualité

**NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC**
**N° BON DE TRAVAIL: 17M264899**
**N° DE PROJET: 649001**
**À L'ATTENTION DE: Pascal Crevier**
**PRÉLEVÉ PAR: D. Désaulniers**
**LIEU DE PRÉLÈVEMENT:**

### Analyse organique de trace

Date du rapport: 2017-10-04			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ			
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.

**Hydrocarbures aromatiques polycycliques (HAP) (sol)**

Acénaphène	8761147	8761147	<0.1	<0.1	0.0	<0.1	98%	70%	130%	NA	70%	130%	100%	70%	130%
Acénaphthylène	8761147	8761147	<0.1	<0.1	0.0	<0.1	82%	70%	130%	NA	70%	130%	81%	70%	130%
Anthracène	8761147	8761147	<0.1	<0.1	0.0	<0.1	89%	70%	130%	NA	70%	130%	91%	70%	130%
Benzo(a)anthracène	8761147	8761147	<0.1	<0.1	0.0	<0.1	91%	70%	130%	NA	70%	130%	90%	70%	130%
Benzo(a)pyrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	93%	70%	130%	NA	70%	130%	93%	70%	130%
Benzo (b) fluoranthène	8761147	8761147	<0.1	<0.1	0.0	<0.1	93%	70%	130%	NA	70%	130%	96%	70%	130%
Benzo (j) fluoranthène	8761147	8761147	<0.1	<0.1	0.0	<0.1	93%	70%	130%	NA	70%	130%	95%	70%	130%
Benzo (k) fluoranthène	8761147	8761147	<0.1	<0.1	0.0	<0.1	92%	70%	130%	NA	70%	130%	93%	70%	130%
Benzo(c)phénanthrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	87%	70%	130%	NA	70%	130%	89%	70%	130%
Benzo(g,h,i)pérylène	8761147	8761147	<0.1	<0.1	0.0	<0.1	104%	70%	130%	NA	70%	130%	103%	70%	130%
Chrysène	8761147	8761147	<0.1	<0.1	0.0	<0.1	94%	70%	130%	NA	70%	130%	100%	70%	130%
Dibenzo(a,h)anthracène	8761147	8761147	<0.1	<0.1	0.0	<0.1	105%	70%	130%	NA	70%	130%	104%	70%	130%
Dibenzo(a,i)pyrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	98%	70%	130%	NA	70%	130%	79%	70%	130%
Dibenzo(a,h)pyrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	107%	70%	130%	NA	70%	130%	84%	70%	130%
Dibenzo(a,l)pyrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	95%	70%	130%	NA	70%	130%	92%	70%	130%
Diméthyl-7,12benzo(a)anthracène	8761147	8761147	<0.1	<0.1	0.0	<0.1	121%	70%	130%	NA	70%	130%	119%	70%	130%
Fluoranthène	8761147	8761147	<0.1	<0.1	0.0	<0.1	90%	70%	130%	NA	70%	130%	93%	70%	130%
Fluorène	8761147	8761147	<0.1	<0.1	0.0	<0.1	100%	70%	130%	NA	70%	130%	100%	70%	130%
Indéno(1,2,3-cd)pyrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	101%	70%	130%	NA	70%	130%	102%	70%	130%
Méthyl-3cholanthrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	91%	70%	130%	NA	70%	130%	77%	70%	130%
Naphtalène	8761147	8761147	<0.1	<0.1	0.0	<0.1	88%	70%	130%	NA	70%	130%	88%	70%	130%
Phénanthrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	96%	70%	130%	NA	70%	130%	101%	70%	130%
Pyrène	8761147	8761147	<0.1	<0.1	0.0	<0.1	95%	70%	130%	NA	70%	130%	98%	70%	130%
Méthyl-1naphtalène	8761147	8761147	<0.1	<0.1	0.0	<0.1	93%	70%	130%	NA	70%	130%	93%	70%	130%
Méthyl-2naphtalène	8761147	8761147	<0.1	<0.1	0.0	<0.1	94%	70%	130%	NA	70%	130%	94%	70%	130%
Diméthyl-1,3naphtalène	8761147	8761147	<0.1	<0.1	0.0	<0.1	100%	70%	130%	NA	70%	130%	103%	70%	130%
Triméthyl-2,3,5naphtalène	8761147	8761147	<0.1	<0.1	0.0	<0.1	79%	70%	130%	NA	70%	130%	78%	70%	130%

**Hydrocarbures pétroliers C10-C50 (sol)**

Hydrocarbures pétroliers C10 à C50	8761147	8761147	< 100	< 100	NA	< 100	80%	70%	130%	NA	70%	130%	83%	70%	130%
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**Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)**

C>10-C16 (F2)	1	8761343	< 10.0	< 10.0	0.0	< 10.0	109%	70%	130%	NA	100%	100%	111%	60%	140%
C>16-C34 (F3)	1	8761343	< 10.0	< 10.0	0.0	< 10.0	113%	70%	130%	NA	100%	100%	118%	60%	140%
C>34-C50 (F4)	1	8761343	< 10.0	< 10.0	0.0	< 10.0	130%	70%	130%	NA	100%	100%	129%	60%	140%
Rec. Nonane (F2-F4)	1	8761343	96	102	6.1	< 1	113%	40%	140%	NA	100%	100%	115%	40%	140%
% Humidité	8761329	8761329	17.5	16.6	5.2	< 0.2	96%	80%	120%	NA	100%	100%	NA	100%	100%

Commentaires: L'analyse des hydrocarbures pétroliers TPH CCME F2-3-4 dans les sols n'est pas contrôlée par le programme d'accréditation du MDDELCC.

**Hydrocarbures aromatiques polycycliques (HAP) (sol)**

Acénaphène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	82%	70%	130%	NA	70%	130%	93%	70%	130%
Acénaphthylène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	76%	70%	130%	NA	70%	130%	74%	70%	130%
Anthracène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	87%	70%	130%	NA	70%	130%	92%	70%	130%

## Contrôle de qualité

**NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC**
**N° BON DE TRAVAIL: 17M264899**
**N° DE PROJET: 649001**
**À L'ATTENTION DE: Pascal Crevier**
**PRÉLEVÉ PAR: D. Désaulniers**
**LIEU DE PRÉLÈVEMENT:**

### Analyse organique de trace (Suite)

Date du rapport: 2017-10-04			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ			
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.
Benzo(a)anthracène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	94%	70%	130%	NA	70%	130%	101%	70%	130%
Benzo(a)pyrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	80%	70%	130%	NA	70%	130%	88%	70%	130%
Benzo (b) fluoranthène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	83%	70%	130%	NA	70%	130%	90%	70%	130%
Benzo (j) fluoranthène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	82%	70%	130%	NA	70%	130%	88%	70%	130%
Benzo (k) fluoranthène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	83%	70%	130%	NA	70%	130%	89%	70%	130%
Benzo(c)phénanthrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	91%	70%	130%	NA	70%	130%	100%	70%	130%
Benzo(g,h,i)pyrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	86%	70%	130%	NA	70%	130%	90%	70%	130%
Chrysène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	89%	70%	130%	NA	70%	130%	96%	70%	130%
Dibenzo(a,h)anthracène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	98%	70%	130%	NA	70%	130%	103%	70%	130%
Dibenzo(a,i)pyrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	94%	70%	130%	NA	70%	130%	90%	70%	130%
Dibenzo(a,h)pyrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	94%	70%	130%	NA	70%	130%	96%	70%	130%
Dibenzo(a,l)pyrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	81%	70%	130%	NA	70%	130%	78%	70%	130%
Diméthyl-7,12benzo(a)anthracène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	111%	70%	130%	NA	70%	130%	111%	70%	130%
Fluoranthène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	102%	70%	130%	NA	70%	130%	110%	70%	130%
Fluorène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	87%	70%	130%	NA	70%	130%	96%	70%	130%
Indéno(1,2,3-cd)pyrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	90%	70%	130%	NA	70%	130%	97%	70%	130%
Méthyl-3cholanthrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	87%	70%	130%	NA	70%	130%	85%	70%	130%
Naphtalène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	86%	70%	130%	NA	70%	130%	76%	70%	130%
Phénanthrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	91%	70%	130%	NA	70%	130%	101%	70%	130%
Pyrène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	102%	70%	130%	NA	70%	130%	110%	70%	130%
Méthyl-1naphtalène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	76%	70%	130%	NA	70%	130%	80%	70%	130%
Méthyl-2naphtalène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	75%	70%	130%	NA	70%	130%	81%	70%	130%
Diméthyl-1,3naphtalène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	83%	70%	130%	NA	70%	130%	89%	70%	130%
Triméthyl-2,3,5naphtalène	8761349	8761349	<0.1	<0.1	0.0	< 0.1	116%	70%	130%	NA	70%	130%	75%	70%	130%

**Hydrocarbures pétroliers C10-C50 (sol)**

Hydrocarbures pétroliers C10 à C50	8761349	8761349	< 100	< 100	NA	< 100	94%	70%	130%	NA	70%	130%	100%	70%	130%
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**Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)**

C>10-C16 (F2)	1	8761384	< 10.0	< 10.0	NA	< 10.0	111%	70%	130%	NA	100%	100%	116%	60%	140%
C>16-C34 (F3)	1	8761384	< 10.0	< 10.0	NA	< 10.0	115%	70%	130%	NA	100%	100%	122%	60%	140%
C>34-C50 (F4)	1	8761384	< 10.0	< 10.0	NA	< 10.0	125%	70%	130%	NA	100%	100%	132%	60%	140%
Rec. Nonane (F2-F4)	1	8761384	99	96	3.1	110	113%	40%	140%	NA	100%	100%	119%	40%	140%

Commentaires: L'analyse des hydrocarbures pétroliers TPH CCME F2-3-4 dans les sols n'est pas contrôlée par le programme d'accréditation du MDDELCC.

**Hydrocarbures pétroliers TPH CCME F2-F4 (Sol)**

C>10-C16 (F2)	1	NA	NA	NA	0.0	< 10.0	110%	70%	130%	NA	100%	100%	NA	60%	140%
C>16-C34 (F3)	1	NA	NA	NA	0.0	< 10.0	112%	70%	130%	NA	100%	100%	NA	60%	140%
C>34-C50 (F4)	1	NA	NA	NA	0.0	< 10.0	123%	70%	130%	NA	100%	100%	NA	60%	140%
Rec. Nonane (F2-F4)	1	NA	NA	NA	0.0	92	86%	40%	140%	NA	100%	100%	NA	40%	140%

Commentaires: L'analyse des hydrocarbures pétroliers TPH CCME F2-3-4 dans les sols n'est pas contrôlée par le programme d'accréditation du MDDELCC.



## Contrôle de qualité

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

À L'ATTENTION DE: Pascal Crevier

PRÉLEVÉ PAR: D. Désaulniers

LIEU DE PRÉLÈVEMENT:

### Analyse organique de trace (Suite)

Date du rapport: 2017-10-04			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ			
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



## Sommaire de méthode

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

N° BON DE TRAVAIL: 17M264899

N° DE PROJET: 649001

À L'ATTENTION DE: Pascal Crevier

PRÉLEVÉ PAR: D. Désaulniers

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
<b>Analyse des Sols</b>					
Argent	2017-09-30	2017-10-02	MET-101-6105F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/MS
Arsenic	2017-09-30	2017-10-02	MET-101-6105F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/MS
Baryum	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Cadmium	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Chrome	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Cobalt	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Cuivre	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Étain	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Manganèse	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Mercure	2017-10-02	2017-10-04	MET-101-6102F	MA. 200 Hg 1.1	COMBUSTION
Molybdène	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Nickel	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Plomb	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Sélénium	2017-09-30	2017-10-02	MET-101-6105F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/MS
Zinc	2017-09-30	2017-10-02	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES

## Sommaire de méthode

**NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC**
**N° BON DE TRAVAIL: 17M264899**
**N° DE PROJET: 649001**
**À L'ATTENTION DE: Pascal Crevier**
**PRÉLEVÉ PAR: D. Désaulniers**
**LIEU DE PRÉLÈVEMENT:**

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
<b>Analyse organique de trace</b>					
Acénaphène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Acénaphylène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Anthracène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(a)anthracène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(a)pyrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo (b) fluoranthène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo (j) fluoranthène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo (k) fluoranthène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(c)phénanthrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(g,h,i)pérylène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Chrysène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,h)anthracène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,i)pyrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,h)pyrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,l)pyrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Diméthyl-7,12benzo(a)anthracène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Fluoranthène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Fluorène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Indéno(1,2,3-cd)pyrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Méthyl-3cholanthrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Naphtalène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Phénanthrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Pyrène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Méthyl-1naphtalène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Méthyl-2naphtalène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Diméthyl-1,3naphtalène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Triméthyl-2,3,5naphtalène	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Acénaphène-D10	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Fluoranthène-D10	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Pérylène-D12	2017-09-28	2017-09-28	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Humidité			LAB-111-4040F	MA.100-ST 1.1	BALANCE
Hydrocarbures pétroliers C10 à C50	2017-10-02	2017-10-02	ORG-100-5104F	MA.400-HYD. 1.1	GC/FID
Nonane	2017-10-02	2017-10-02	ORG-100-5104F	MA.400-HYD. 1.1	GC/FID
Humidité			LAB-111-4040F	MA.100-ST 1.1	BALANCE
C>10-C16 (F2)	2017-09-29	2017-09-29	ORG-160-5110F	Méthode CCME 1er volet	GC/FID
C>16-C34 (F3)	2017-09-29	2017-09-29	ORG-160-5110F	Méthode CCME 1er volet	GC/FID
C>34-C50 (F4)	2017-09-29	2017-09-29	ORG-160-5110F	Méthode CCME 1er volet	GC/FID
Hydrocarbures lourds par gravimétrie (F4G-sg)	2017-09-29	2017-09-29	ORG-160-5110F	Méthode CCME 1er volet	GRAVIMÉTRIE
Rec. Nonane (F2-F4)	2017-09-29	2017-09-29	ORG-160-5110F	Méthode CCME 1er volet	GC/FID
% Humidité	2017-09-29	2017-09-29	INOR-161-6006F	MA. 100 - S.T. 1.0	BALANCE



Bon de travail AGAT: \_\_\_\_\_  
Nb. de glaciers: \_\_\_\_\_  
Température à l'arrivée: \_\_\_\_\_  
Scélé légal intact:  Oui  Non  N/A

## Chaîne de traçabilité - Environnement

### Information du client

Compagnie: **SNC-Lavalin GEM Québec**  
Adresse: **275 Benjamin-Hudon Montréal**  
Téléphone: **514-331-6913** Téléc.: \_\_\_\_\_  
Projet: **649001**  
Lieu de prélèvement: \_\_\_\_\_  
Prélevé par: **D. Desautniers**

### Rapport envoyé à

1. Nom: **Pascal Crevier**  
Courriel: **pascal.crevier@snc-lavalin.com**  
2. Nom: \_\_\_\_\_  
Courriel: \_\_\_\_\_

### Critères à respecter

PRTC ABC  RESC  
 CCME Autre: \_\_\_\_\_  
 Eau consommation  
 Eau résurg. Surface  
 Eau résurg. Salée  
CMM Sanitaire  Pluvial

### Délais d'analyse requis (jours ouvrables)

Environnemental: Régulier:  5 à 7 jours Urgent:  < 12 heures  
Haute Résolution: Régulier:  10 à 15 jours Urgent:  < 10 jours  
Date Requite: \_\_\_\_\_  
A3/MM/JJ

### Facturé à

Même adresse:  Oui  Non  
Compagnie: **SNC-Lavalin GEM Québec**  
Contact: **Comptes à payer**  
Courriel: **payables@snc-lavalin.com**  
Adresse: **1455 René-Lévesque Ouest, 6<sup>e</sup> étage Montréal**  
Bon de commande: **649001-0002** Soumission: **153654 VS**

### Commentaires:

### Matrice (légende)

EP	Eau potable (Note pour réseau: Veuillez fournir votre formulaire MDDELCC)
S	Sol
B	Boue
SE	Sédiment
ES	Eau de surface
AF	Affluent
SL	Solide
EU	Eau usée
EF	Effluent
ST	Eau souterraine
A	Air

IDENTIFICATION DE L'ÉCHANTILLON	PRÉLÈVEMENT		MATRICE	NB. DE CONTENANTS
	DATE (AA/MM/JJ)	HEURE		
F-07/CF-10	09-11		S	1
F-08/CF-2	09-12		S	1
F-08/CF-3	"		S	1
F-09/CF-1	"		S	1
F-09/CF-3	"		S	1
F-10/CF-1	"		S	1
F-10/CF-2	"		S	1
F-11/CF-1	"		S	1
F-11/CF-3	"		S	1
F-12/CF-1	"		S	1
F-12/CF-2	"		S	1
F-13/CF-1	"		S	1

### Format de rapport

Portrait (échantillon/page)  Paysage (échantillons/page)

LES ÉCHANTILLONS REÇUS APRÈS 16 H SERONT ENREGISTRÉS COMME ÉTANT REÇUS LE JOUR OUVRABLE SUIVANT

BTEX		HAM	COV: HAC-HAM	THM	COURT DÉLAI DE CONSERVATION									
Hydrocarbures pétroliers C10-C50					Métaux dissous filtrés au laboratoire:					Métaux (spécifier):				
AGR <input type="checkbox"/> Chlorobenzènes <input type="checkbox"/> Phtalates <input type="checkbox"/>					pH <input type="checkbox"/> NO <sub>2</sub> <input type="checkbox"/> NO <sub>3</sub> <input type="checkbox"/> o-P04 <input type="checkbox"/>					13 Métaux TC - Sol <input checked="" type="checkbox"/> 17 Métaux TC - Eau <input type="checkbox"/>				
BPC: Congénères <input type="checkbox"/> Aroclor <input type="checkbox"/>					Absorbance UV <input type="checkbox"/> Couleur <input type="checkbox"/> Turbidité <input type="checkbox"/>					Mercur <input checked="" type="checkbox"/> Sélénium - Sol <input type="checkbox"/> Dureté totale <input type="checkbox"/>				
Éthylène glycol <input type="checkbox"/> Glycols (balayage) <input type="checkbox"/>					DBO <sub>5</sub> <input type="checkbox"/> Carbonée <input type="checkbox"/> Chrome hexavalent <input type="checkbox"/>					Alcalinité <input type="checkbox"/> Bicarbonates <input type="checkbox"/> Conductivité <input type="checkbox"/>				
Formaldéhyde					Coliformes: Totaux <input type="checkbox"/> Féciaux <input type="checkbox"/> E.coli <input type="checkbox"/>					Chlorures <input type="checkbox"/> Fluorures <input type="checkbox"/> Sulfates <input type="checkbox"/> Bromures <input type="checkbox"/>				
Huiles et graisses: Minérales <input type="checkbox"/> Totales <input type="checkbox"/>					Microbiologie (autre):					Cyanures: Totaux <input type="checkbox"/> Disposables <input type="checkbox"/> Oxydables <input type="checkbox"/>				
Pesticides (spécifier):					HR/MS: PCDD/PCDF <input type="checkbox"/> HAP <input type="checkbox"/> BPC <input type="checkbox"/>					DCO <input type="checkbox"/> P total <input type="checkbox"/> COT <input type="checkbox"/>				
Phénols (GC-MS) <input type="checkbox"/> Indice phénolique (4AAP) <input type="checkbox"/>					CMM 2008-47: Sanitaire <input type="checkbox"/> Pluvial <input type="checkbox"/>					NH <sub>3</sub> <input type="checkbox"/> NTK <input type="checkbox"/> NO <sub>2</sub> + NO <sub>3</sub> <input type="checkbox"/>				
6 Métaux (Cd, Cr, Cu, Ni, Pb, Zn)					RMD <input type="checkbox"/> REIMR art <input type="checkbox"/>					Solides: Totaux <input type="checkbox"/> Dissous <input type="checkbox"/> MES <input type="checkbox"/> MESV <input type="checkbox"/>				
13 Métaux TC - Sol <input checked="" type="checkbox"/> 17 Métaux TC - Eau <input type="checkbox"/>										Sulfures - Eau <input type="checkbox"/> Soufre total - Sol <input type="checkbox"/>				
Métaux (spécifier):														

Échantillon remis par (nom en lettres moulées et signature) <b>Pascal Crevier</b>	Date (AA/MM/JJ) <b>09-27</b>	Heure <b>11h15</b>	Échantillon reçu par (nom en lettres moulées et signature) <b>LADAR F.</b>	Date (AA/MM/JJ) <b>09-27</b>	Heure <b>11:28</b>	Page <b>2</b> de <b>4</b>
Échantillon remis par (nom en lettres moulées et signature)	Date (AA/MM/JJ)	Heure	Échantillon reçu par (nom en lettres moulées et signature)	Date (AA/MM/JJ)	Heure	N°: <b>170320</b>



Bon de travail AGAT: \_\_\_\_\_  
Nb. de glacières: \_\_\_\_\_  
Température à l'arrivée: \_\_\_\_\_  
Scellé légal Intact:  Oui  Non  N/A

## Chaîne de traçabilité - Environnement

**Information du client**  
Compagnie: SNC-Lavalin GEM Québec  
Adresse: 275, Benjamin-Hudon  
Montréal  
Téléphone: 514-331-6913 Téléc.: \_\_\_\_\_  
Projet: 649 001  
Lieu de prélèvement: \_\_\_\_\_  
Prélevé par: D. Desautniers

**Rapport envoyé à**  
1. Nom: Pascal Crevier  
Courriel: pascal.crevier@snc-lavalin.com  
2. Nom: \_\_\_\_\_  
Courriel: \_\_\_\_\_

**Critères à respecter**  
 PRTC ABC  RESC  
 CCME Autre: \_\_\_\_\_  
 Eau consommation  
 Eau résurg. Surface  
 Eau résurg. Salée  
CMM Sanitaire  Pluvial

**Délais d'analyse requis (jours ouvrables)**  
Environnemental: Haute Résolution:  
Régulier:  5 à 7 jours Régulier:  10 à 15 jours  
Urgent:  < 12 heures Urgent:  < 10 jours  
Date Requête: \_\_\_\_\_  
AA/MM/JJ

**Format de rapport**  
 Portrait (échantillon/page)  Paysage (échantillons/page)

LES ÉCHANTILLONS REÇUS APRÈS 16 H SERONT ENREGISTRÉS COMME ÉTANT REÇUS LE JOUR OUVRABLE SUIVANT

**Facturé à** Même adresse:  Oui  Non  
Compagnie: SNC-Lavalin GEM Québec  
Contact: Comptes à payer  
Courriel: payables@snc-lavalin.com  
Adresse: 465 René-Lévesque Ouest, 6<sup>e</sup> étage  
Montréal  
Bon de commande: 649001-0002 Soumission: 153654 V5

**Commentaires:**

**Matrice (légende)**

EP	Eau potable (Note pour réseau: Veuillez fournir votre formulaire MDDELC)
S	Sol
B	Boue
SE	Sédiment
ES	Eau de surface
AF	Affluent
SL	Solide
EU	Eau usée
EF	Effluent
ST	Eau souterraine
A	Air

IDENTIFICATION DE L'ÉCHANTILLON	PRÉLEVEMENT		MATRICE	NB. DE CONTENANTS
	DATE (AA/MM/JJ)	HEURE		
F-13/CF-3	09-12		S	1
F-14/CF-2	"		S	1
F-14/CF-3	"		S	1
F-15/CF-1	09-13		S	1
F-15/CF-3	"		S	1
F-16/CF-1	"		S	1
F-16/CF-3	"		S	1
F-17/CF-1	"		S	1
F-17/CF-3	"		S	1
F-18/CF-1	"		S	1
F-18/CF-3	"		S	1
F-19/CF-1	"		S	1

COV: HAC-HAM		THM	COURT DÉLAI DE CONSERVATION	
BTEX	HAM	THM		
Hydrocarbures pétroliers C10-C50				
ASR	Chlorobenzénates	Phthalates		
BPC: Congénères	Aroclor			
Ethylène Glycol	Glycols (polyglycols)			
Formaldéhyde				
Huiles et graisses: Minérales	Totaux			
Pesticides (spécifier):				
Phénols (GC-MS)	Indice phénolique (4AAP)			
6 Métaux (Cd, Cr, Cu, Ni, Pb, Zn)				
13 Métaux TC - Sol	17 Métaux TC - Eau			
Métaux (spécifier):				
Mercurure	Sélénium - Sol	Dureté totale		
Alcalinité	Bicarbonates	Conductivité		
Chlorures	Fluorures	Sulfates	Bromures	
Cyanures: Totaux	Disponibles	Oxydables		
DCO	P total	COT		
NH <sub>3</sub>	NTK	NO <sub>2</sub> + NO <sub>3</sub>		
Solides: Totaux	Dissouts	MES	MESV	
Sulfures: Eau	Soufre total - Sol			
Métaux dissous filtrés au laboratoire:				
pH	NO <sub>2</sub>	NO <sub>3</sub>	o-P04	
Absorbance UV	Couleur	Turbidité		
DBO <sub>5</sub>	DBO <sub>5</sub> Carbonée	Chrome hexavalent		
Coliformes: Totaux	Fécules	E.coli		
Microbiologie (autre):				
HR/MS: PCDD/PCDF	HAP	BPC		
CMM 2008-47: Sanitaire	Pluvial			
RMD	REIMR art.			

Échantillon remis par (nom en lettres moulées et signature): Pascal Crevier  
Date (AA/MM/JJ): 09-27 Heure: 11h5

Échantillon reçu par (nom en lettres moulées et signature): LAGAR F.  
Date (AA/MM/JJ): \_\_\_\_\_ Heure: \_\_\_\_\_

Échantillon remis par (nom en lettres moulées et signature): Pascal Crevier  
Date (AA/MM/JJ): 09/27/2017 Heure: 11:26

Page 3 de 4  
N°: **170321**



**NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC  
275 BENJAMIN-HUDON  
MONTREAL, QC H4N1J1  
(514) 331-6910**

**À L'ATTENTION DE: Pascal Crevier**

**N° DE PROJET: 649001**

**N° BON DE TRAVAIL: 17M279246**

**ANALYSE DES SOLS VÉRIFIÉ PAR: Amar Bellahsene, Chimiste**

**ORGANIQUE DE TRACE VÉRIFIÉ PAR: Robert Roch, Chimiste**

**DATE DU RAPPORT: 2017-11-10**

**VERSION\*: 2**

**NOMBRE DE PAGES: 11**

Si vous désirez de l'information concernant cette analyse, S.V.P. contacter votre chargé de projets au (514) 337-1000.

**\*NOTES**

VERSION 2: ajout des critères pour la province des Appalaches

**Nous disposerons des échantillons dans les 30 jours suivants les analyses. S.V.P. Contactez le laboratoire si vous désirez avoir un délai d'entreposage.**



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D.Desaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Métaux Extractibles Totaux (sol) PRTC

DATE DE RÉCEPTION: 2017-11-01

DATE DU RAPPORT: 2017-11-10

IDENTIFICATION DE L'ÉCHANTILLON: F-2/CF-4  
MATRICE: Sol  
DATE D'ÉCHANTILLONNAGE: 2017-08-11  
8872111

Paramètre	Unités	C / N : A	C / N : B	C / N : C	C / N : D	LDR	
Argent	mg/kg	0.8	20	40	200	0.5	<0.5[<A]
Arsenic	mg/kg	19	30	50	250	5.0	<5.0[<A]
Baryum	mg/kg	350	500	2000	10000	20	26[<A]
Cadmium	mg/kg	1.3	5	20	100	0.9	<0.9[<A]
Chrome	mg/kg	100	250	800	4000	45	<45[<A]
Cobalt	mg/kg	25	50	300	1500	15	<15[<A]
Cuivre	mg/kg	65	100	500	2500	40	<40[<A]
Étain	mg/kg	5	50	300	1500	5	<5[<A]
Manganèse	mg/kg	1000	1000	2200	11000	10	657[<A]
Mercuré	mg/kg	0.3	2	10	50	0.2	<0.2[<A]
Molybdène	mg/kg	2	10	40	200	2	<2[<A]
Nickel	mg/kg	50	100	500	2500	30	<30[<A]
Plomb	mg/kg	40	500	1000	5000	30	<30[<A]
Sélénium	mg/kg	3	3	10	50	1.0	<1.0[<A]
Zinc	mg/kg	155	500	1500	7500	100	<100[<A]

**Commentaires:** LDR - Limite de détection rapportée; C / N - Critères Normes: A se réfère QC PTC 2016 A (App), B se réfère QC PTC 2016 B, C se réfère QC PTC 2016 C, D se réfère QC RESC (Annexe 1)  
Les valeurs des critères sont uniquement fournies comme référence générale. Les critères fournis peuvent être ou ne pas être pertinents pour l'utilisation prévue. Se référer directement à la norme applicable pour l'interprétation réglementaire.

**8872111** Une LDR plus élevée indique qu'une dilution a été effectuée afin de réduire la concentration des analytes ou de réduire l'interférence de la matrice.

Certifié par:



*[Signature]*

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.





NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D.Desaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-11-01

DATE DU RAPPORT: 2017-11-10

IDENTIFICATION DE L'ÉCHANTILLON: F-2/CF-4  
MATRICE: Sol  
DATE D'ÉCHANTILLONNAGE: 2017-08-11  
8872111

Paramètre	Unités	C / N : A	C / N : B	C / N : C	C / N : D	LDR	
Acénaphène	mg/kg	0.1	10	100	100	0.1	<0.1[<A]
Acénaphylène	mg/kg	0.1	10	100	100	0.1	<0.1[<A]
Anthracène	mg/kg	0.1	10	100	100	0.1	<0.1[<A]
Benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Benzo(a)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Benzo (b) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1[<A]
Benzo (j) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1[<A]
Benzo (k) fluoranthène	mg/kg	0.1	1	10	136	0.1	<0.1[<A]
Benzo(c)phénanthrène	mg/kg	0.1	1	10	56	0.1	<0.1[<A]
Benzo(g,h,i)pérylène	mg/kg	0.1	1	10	18	0.1	<0.1[<A]
Chrysène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	82	0.1	<0.1[<A]
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Diméthyl-7,12benzo(a)anthracène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Fluoranthène	mg/kg	0.1	10	100	100	0.1	<0.1[<A]
Fluorène	mg/kg	0.1	10	100	100	0.1	<0.1[<A]
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	34	0.1	<0.1[<A]
Méthyl-3cholanthrène	mg/kg	0.1	1	10	150	0.1	<0.1[<A]
Naphtalène	mg/kg	0.1	5	50	56	0.1	<0.1[<A]
Phénanthrène	mg/kg	0.1	5	50	56	0.1	<0.1[<A]
Pyrène	mg/kg	0.1	10	100	100	0.1	<0.1[<A]
Méthyl-1naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1[<A]
Méthyl-2naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1[<A]
Diméthyl-1,3naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1[<A]
Triméthyl-2,3,5naphtalène	mg/kg	0.1	1	10	56	0.1	<0.1[<A]
Humidité	%					0.1	14.5

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



## Certificat d'analyse

N° BON DE TRAVAIL: 17M279246

N° DE PROJET: 649001

9770 ROUTE TRANSCANADIENNE  
ST. LAURENT, QUEBEC  
CANADA H4S 1V9  
TEL (514)337-1000  
FAX (514)333-3046  
<http://www.agatlabs.com>

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D.Desaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures aromatiques polycycliques (HAP) (sol)

DATE DE RÉCEPTION: 2017-11-01

DATE DU RAPPORT: 2017-11-10

IDENTIFICATION DE L'ÉCHANTILLON: F-2/CF-4

MATRICE: Sol

DATE D'ÉCHANTILLONNAGE: 2017-08-11

Étalon de recouvrement	Unités	Limites	8872111
Acénaphthène-D10	%	40-140	126
Fluoranthène-D10	%	40-140	90
Pérylène-D12	%	40-140	85

**Commentaires:** LDR - Limite de détection rapportée; C / N - Critères Normes: A se réfère QC PTC 2016 A, B se réfère QC PTC 2016 B, C se réfère QC PTC 2016 C, D se réfère QC RESC (Annexe 1)  
Les valeurs des critères sont uniquement fournies comme référence générale. Les critères fournis peuvent être ou ne pas être pertinents pour l'utilisation prévue. Se référer directement à la norme applicable pour l'interprétation réglementaire.

**8872111** Une LDR plus élevée indique qu'une dilution a été effectuée afin de réduire la concentration des analytes ou de réduire l'interférence de la matrice.

Certifié par:



*Robert Roch*

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.



NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

PRÉLEVÉ PAR: D.Desaulniers

À L'ATTENTION DE: Pascal Crevier

LIEU DE PRÉLÈVEMENT:

### Hydrocarbures pétroliers C10-C50 (sol)

DATE DE RÉCEPTION: 2017-11-01

DATE DU RAPPORT: 2017-11-10

Paramètre	Unités	C / N: A	C / N: B	C / N: C	C / N: D	IDENTIFICATION DE L'ÉCHANTILLON:	
						F-2/CF-4	MATRICE: Sol
						DATE D'ÉCHANTILLONNAGE: 2017-08-11	
						LDR	8872111
Hydrocarbures pétroliers C10 à C50	mg/kg	300	700	3500	10000	100	<100[<A]
Humidité	%					0.1	14.5
Étalon de recouvrement		Unités		Limites			
Nonane	%			40-140			72

**Commentaires:** LDR - Limite de détection rapportée; C / N - Critères Normes: A se réfère QC PTC 2016 A, B se réfère QC PTC 2016 B, C se réfère QC PTC 2016 C, D se réfère QC RESC (Annexe 1)  
Les valeurs des critères sont uniquement fournies comme référence générale. Les critères fournis peuvent être ou ne pas être pertinents pour l'utilisation prévue. Se référer directement à la norme applicable pour l'interprétation réglementaire.

**8872111** Une LDR plus élevée indique qu'une dilution a été effectuée afin de réduire la concentration des analytes ou de réduire l'interférence de la matrice.

Certifié par:



Robert Roch

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## Contrôle de qualité

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC  
 N° DE PROJET: 649001  
 PRÉLEVÉ PAR: D.Desaulniers

N° BON DE TRAVAIL: 17M279246  
 À L'ATTENTION DE: Pascal Crevier  
 LIEU DE PRÉLÈVEMENT:

Analyse des Sols															
Date du rapport: 2017-11-10			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ			
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.
<b>Métaux Extractibles Totaux (sol) PRTC</b>															
Argent	8872114		<0.5	<0.5	NA	< 0.5	108%	80%	120%	112%	80%	120%	113%	80%	120%
Arsenic	8872114		<5.0	<5.0	NA	< 5.0	99%	80%	120%	112%	80%	120%	99%	80%	120%
Baryum	8872114		55	62	NA	< 20	97%	80%	120%	96%	80%	120%	NA	80%	120%
Cadmium	8872114		<0.9	<0.9	NA	< 0.9	98%	80%	120%	102%	80%	120%	110%	80%	120%
Chrome	8872114		<45	<45	NA	< 45	99%	80%	120%	98%	80%	120%	120%	80%	120%
Cobalt	8872114		<15	<15	NA	< 15	99%	80%	120%	100%	80%	120%	110%	80%	120%
Cuivre	8872114		<40	<40	NA	< 40	99%	80%	120%	97%	80%	120%	115%	80%	120%
Étain	8872114		<5	<5	NA	< 5	114%	80%	120%	96%	80%	120%	NA	80%	120%
Manganèse	8872114		314	350	10.8	< 10	89%	80%	120%	99%	80%	120%	NA	80%	120%
Mercuré	8884103		0.4	0.4	NA	< 0.2	74%	80%	120%	85%	80%	120%	NA	80%	120%
Molybdène	8872114		3	2	NA	< 2	105%	80%	120%	104%	80%	120%	115%	80%	120%
Nickel	8872114		<30	<30	NA	< 30	98%	80%	120%	103%	80%	120%	NA	80%	120%
Plomb	8872114		<30	<30	NA	< 30	98%	80%	120%	96%	80%	120%	108%	80%	120%
Sélénium	8872114		<1.0	<1.0	NA	< 1.0	97%	80%	120%	104%	80%	120%	96%	80%	120%
Zinc	8872114		<100	<100	NA	< 100	96%	80%	120%	99%	80%	120%	109%	80%	120%

Commentaires: NA : Non applicable

NA dans l'écart du duplicata indique que l'écart n'a pu être calculé car l'un ou les deux résultats sont < 5x LDR.

NA dans le pourcentage de récupération de l'échantillon fortifié indique que le résultat n'est pas fourni en raison de l'hétérogénéité de l'échantillon ou de la concentration trop élevée par rapport à l'ajout.

NA dans le blanc fortifié ou le MRC indique qu'il n'est pas requis par la procédure.

Le pourcentage de récupération du MRC peut être en dehors du critère d'acceptabilité de 80-120%, s'il est conforme à l'écart du certificat du matériau de référence.

Certifié par:



La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.

## Contrôle de qualité

**NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC**
**N° BON DE TRAVAIL: 17M279246**
**N° DE PROJET: 649001**
**À L'ATTENTION DE: Pascal Crevier**
**PRÉLEVÉ PAR: D.Desaulniers**
**LIEU DE PRÉLÈVEMENT:**

### Analyse organique de trace

Date du rapport: 2017-11-10			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ			
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.
<b>Hydrocarbures aromatiques polycycliques (HAP) (sol)</b>															
Acénaphthène	8873715		<0.1	<0.1	NA	< 0.1	116%	70%	130%	NA	70%	130%	117%	70%	130%
Acénaphthylène	8873715		<0.1	<0.1	NA	< 0.1	113%	70%	130%	NA	70%	130%	114%	70%	130%
Anthracène	8873715		<0.1	<0.1	NA	< 0.1	117%	70%	130%	NA	70%	130%	120%	70%	130%
Benzo(a)anthracène	8873715		<0.1	<0.1	NA	< 0.1	107%	70%	130%	NA	70%	130%	NA	70%	130%
Benzo(a)pyrène	8873715		<0.1	<0.1	NA	< 0.1	83%	70%	130%	NA	70%	130%	103%	70%	130%
Benzo (b) fluoranthène	8873715		<0.1	<0.1	NA	< 0.1	88%	70%	130%	NA	70%	130%	101%	70%	130%
Benzo (j) fluoranthène	8873715		<0.1	<0.1	NA	< 0.1	86%	70%	130%	NA	70%	130%	112%	70%	130%
Benzo (k) fluoranthène	8873715		<0.1	<0.1	NA	< 0.1	84%	70%	130%	NA	70%	130%	106%	70%	130%
Benzo(c)phénanthrène	8873715		<0.1	<0.1	NA	< 0.1	115%	70%	130%	NA	70%	130%	116%	70%	130%
Benzo(g,h,i)pérylène	8873715		<0.1	<0.1	NA	< 0.1	86%	70%	130%	NA	70%	130%	97%	70%	130%
Chrysène	8873715		<0.1	<0.1	NA	< 0.1	98%	70%	130%	NA	70%	130%	95%	70%	130%
Dibenzo(a,h)anthracène	8873715		<0.1	<0.1	NA	< 0.1	93%	70%	130%	NA	70%	130%	110%	70%	130%
Dibenzo(a,i)pyrène	8873715		<0.1	<0.1	NA	< 0.1	80%	70%	130%	NA	70%	130%	70%	70%	130%
Dibenzo(a,h)pyrène	8873715		<0.1	<0.1	NA	< 0.1	71%	70%	130%	NA	70%	130%	77%	70%	130%
Dibenzo(a,l)pyrène	8873715		<0.1	<0.1	NA	< 0.1	87%	70%	130%	NA	70%	130%	87%	70%	130%
Diméthyl-7,12benzo(a)anthracène	8873715		<0.1	<0.1	NA	< 0.1	99%	70%	130%	NA	70%	130%	126%	70%	130%
Fluoranthène	8873715		<0.1	<0.1	NA	< 0.1	115%	70%	130%	NA	70%	130%	121%	70%	130%
Fluorène	8873715		<0.1	<0.1	NA	< 0.1	81%	70%	130%	NA	70%	130%	84%	70%	130%
Indéno(1,2,3-cd)pyrène	8873715		<0.1	<0.1	NA	< 0.1	88%	70%	130%	NA	70%	130%	110%	70%	130%
Méthyl-3cholanthrène	8873715		<0.1	<0.1	NA	< 0.1	104%	70%	130%	NA	70%	130%	109%	70%	130%
Naphtalène	8873715		<0.1	<0.1	NA	< 0.1	104%	70%	130%	NA	70%	130%	103%	70%	130%
Phénanthrène	8873715		<0.1	<0.1	NA	< 0.1	103%	70%	130%	NA	70%	130%	103%	70%	130%
Pyrene	8873715		<0.1	<0.1	NA	< 0.1	115%	70%	130%	NA	70%	130%	123%	70%	130%
Méthyl-1naphtalène	8873715		<0.1	<0.1	NA	< 0.1	107%	70%	130%	NA	70%	130%	107%	70%	130%
Méthyl-2naphtalène	8873715		<0.1	<0.1	NA	< 0.1	110%	70%	130%	NA	70%	130%	99%	70%	130%
Diméthyl-1,3naphtalène	8873715		<0.1	0.2	NA	< 0.1	121%	70%	130%	NA	70%	130%	119%	70%	130%
Triméthyl-2,3,5naphtalène	8873715		<0.1	<0.1	NA	< 0.1	75%	70%	130%	NA	70%	130%	74%	70%	130%

Commentaires: NA : Non applicable

NA dans l'écart du duplicata indique que l'écart n'a pu être calculé car l'un ou les deux résultats sont &lt; 5x LDR.

NA dans le pourcentage de récupération de l'échantillon fortifié indique que le résultat n'est pas fourni en raison de l'hétérogénéité de l'échantillon ou de la concentration trop élevée par rapport à l'ajout.

NA dans le blanc fortifié ou le MRC indique qu'il n'est pas requis par la procédure.

L'écart acceptable est applicable pour 90% des composés. Pour les 10% des composés restants, un écart de 40 à 160% est acceptable.

**Hydrocarbures pétroliers C10-C50 (sol)**

Hydrocarbures pétroliers C10 à C50	8873715		195	160	NA	< 100	85%	70%	130%	NA	70%	130%	NA	70%	130%
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## Contrôle de qualité

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

N° BON DE TRAVAIL: 17M279246

N° DE PROJET: 649001

À L'ATTENTION DE: Pascal Crevier

PRÉLEVÉ PAR: D.Desaulniers

LIEU DE PRÉLÈVEMENT:

### Analyse organique de trace (Suite)

Date du rapport: 2017-11-10			DUPLICATA			MATÉRIAU DE RÉFÉRENCE			BLANC FORTIFIÉ			ÉCH. FORTIFIÉ			
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.

Commentaires: NA : Non applicable

NA dans l'écart du duplicata indique que l'écart n'a pu être calculé car l'un ou les deux résultats sont &lt; 5x LDR.

NA dans le pourcentage de récupération de l'échantillon fortifié indique que le résultat n'est pas fourni en raison de l'hétérogénéité de l'échantillon ou de la concentration trop élevée par rapport à l'ajout.

NA dans le blanc fortifié ou le MRC indique qu'il n'est pas requis par la procédure.

Certifié par:



Robert Roch

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.

## Sommaire de méthode

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

N° BON DE TRAVAIL: 17M279246

N° DE PROJET: 649001

À L'ATTENTION DE: Pascal Crevier

PRÉLEVÉ PAR: D.Desaulniers

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
<b>Analyse des Sols</b>					
Argent	2017-11-04	2017-11-04	MET-101-6105F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/MS
Arsenic	2017-11-04	2017-11-04	MET-101-6105F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/MS
Baryum	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Cadmium	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Chrome	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Cobalt	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Cuivre	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Étain	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Manganèse	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Mercure	2017-11-09	2017-11-09	MET-101-6102F	MA. 200 Hg 1.1	COMBUSTION
Molybdène	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Nickel	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Plomb	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES
Sélénium	2017-11-04	2017-11-04	MET-101-6105F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/MS
Zinc	2017-11-04	2017-11-04	MET-101-6107F	MA. 200 - Mét 1.2 ; MA. 203 - Mét 3.2	ICP/OES

## Sommaire de méthode

NOM DU CLIENT: SNC-LAVALIN GEM QUEBEC INC

N° BON DE TRAVAIL: 17M279246

N° DE PROJET: 649001

À L'ATTENTION DE: Pascal Crevier

PRÉLEVÉ PAR: D.Desaulniers

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
<b>Analyse organique de trace</b>					
Acénaphène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Acénaphylène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Anthracène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(a)anthracène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(a)pyrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo (b) fluoranthène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo (j) fluoranthène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo (k) fluoranthène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(c)phénanthrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Benzo(g,h,i)pérylène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Chrysène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,h)anthracène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,i)pyrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,h)pyrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Dibenzo(a,l)pyrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Diméthyl-7,12benzo(a)anthracène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Fluoranthène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Fluorène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Indéno(1,2,3-cd)pyrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Méthyl-3cholanthrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Naphtalène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Phénanthrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Pyrène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Méthyl-1naphtalène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Méthyl-2naphtalène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Diméthyl-1,3naphtalène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Triméthyl-2,3,5naphtalène	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Acénaphène-D10	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Fluoranthène-D10	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Pérylène-D12	2017-11-03	2017-11-03	ORG-100-5102F	MA.400-HAP 1.1	GC/MS
Humidité			LAB-111-4040F	MA.100-ST 1.1	BALANCE
Hydrocarbures pétroliers C10 à C50	2017-11-03	2017-11-03	ORG-100-5104F	MA.400-HYD. 1.1	GC/FID
Nonane	2017-11-03	2017-11-03	ORG-100-5104F	MA.400-HYD. 1.1	GC/FID
Humidité	2017-11-03	2017-11-03	LAB-111-4040F	MA.100-ST 1.1	BALANCE





## Appendix 5

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Soil Management Table  
(Annexe 5 - Guide d'intervention – Protection des sols et réhabilitation des terrains  
contaminés)

### Annexe 5 : Grille de gestion des sols excavés

La grille de gestion des sols excavés ne s'applique, pour les critères supérieurs à A, que pour une contamination de nature anthropique. Si la concentration naturelle dans le sol est supérieure à A, la gestion des sols contenant cette concentration naturelle est considérée comme équivalente à celle attribuable au critère A.

#### ≤ critère A<sup>1</sup>

Utilisés sans restriction sur tout terrain.

#### < critère B (valeurs limites de l'annexe I du RPRT)

1. Ailleurs que sur le terrain d'origine, les sols ne peuvent être déposés que sur des sols dont la concentration en contaminants est égale ou supérieure à celle des sols remblayés (article 4 du RSCTSC) et s'ils n'émettent pas d'odeurs d'hydrocarbures perceptibles.
2. Aux mêmes conditions, déposés sur ou dans des terrains destinés à l'habitation s'ils sont utilisés comme matériau de remblayage dans le cadre de travaux de réhabilitation de terrains faits conformément à la LQE.

#### ≤ critère B (valeurs limites de l'annexe I du RPRT)

1. Valorisés sur le terrain d'origine ou sur le terrain à partir duquel a eu lieu l'activité à l'origine de la contamination.
2. Valorisés comme matériau de recouvrement journalier ou final dans un lieu d'enfouissement technique (LET) ou comme matériau de recouvrement hebdomadaire ou final dans un lieu d'enfouissement en tranchée ou comme recouvrement mensuel ou final dans un lieu d'enfouissement de débris de construction ou de démolition, conformément au REIMR aux conditions des articles 42, 50, 90, 91, 105 ou 106.
3. Valorisés comme recouvrement final dans un lieu d'enfouissement de sols contaminés (LESC) aux conditions décrites à l'article 38 du RESC ou valorisés dans un système de captage des gaz prévu à l'article 13 du RESC.
4. Valorisés comme recouvrement final d'un lieu de dépôt définitif de matières dangereuses aux conditions de l'article 101 du RMD.
5. Valorisés comme matériau de recouvrement final dans un système de gestion qui comporte le dépôt définitif par enfouissement de déchets de fabriques de pâtes et papiers, aux conditions de l'article 116 du Règlement sur les fabriques de pâtes et papiers (RFPP).
6. Valorisés sur un lieu d'élimination nécessitant un recouvrement, aux conditions prévues au certificat d'autorisation en vertu de l'article 22 de la LQE.
7. Valorisés avec ou sans MRF, comme matériau apte à la végétation dans des projets de restauration d'aires d'accumulation de résidus miniers<sup>2</sup> ou dans la couverture de lieux visés par le RFPP, le RESC ou le RMD. Ne doit dégager aucune odeur d'hydrocarbures perceptible. Dans le cas d'ajout de MRF, le projet doit être autorisé et respecter le *Guide sur l'utilisation de matières résiduelles fertilisantes pour la restauration de la couverture végétale de lieux dégradés*<sup>3</sup>.
8. Valorisés comme couche de protection d'une géomembrane utilisée dans un système multicouche lors de la restauration d'une aire d'accumulation de résidus miniers générateurs d'acide<sup>2</sup>.

<p>9. Éliminés dans un lieu d'enfouissement visé par le RESC.</p> <p>10. Éliminés dans un LET, un lieu d'enfouissement en tranchée, un lieu d'enfouissement en milieu nordique, un lieu d'enfouissement de débris de construction ou de démolition ou un lieu d'enfouissement en territoire isolé, conformément à l'article 4 du REIMR.</p>
<p><b>≥ critère B et ≤ critère C</b></p> <p>1. Utilisés sur le terrain d'origine comme matériau de remblayage à la condition que les concentrations mesurées respectent les critères ou valeurs limites réglementaires applicables aux sols selon l'usage et le zonage.</p> <p>2. Valorisés comme matériau de recouvrement dans un LET ou comme matériau de recouvrement hebdomadaire dans un lieu d'enfouissement en tranchée, aux conditions des articles 42, 50 ou 90 du REIMR. Ces conditions incluent notamment que les concentrations de composés organiques volatils soient égales ou inférieures aux critères B.</p> <p>3. Traités sur place ou dans un lieu de traitement autorisé.</p> <p>4. Éliminés dans un lieu d'enfouissement visé par le RESC.</p>
<p><b>&lt; annexe I du RESC</b></p> <p>1. Utilisés pour remplir des dépressions naturelles ou des excavations sur le terrain d'origine lors de travaux de réhabilitation aux conditions prévues dans le plan de réhabilitation approuvé dans le cadre d'une analyse de risques (dossiers GTE), à la condition que les C<sub>10</sub>-C<sub>50</sub> et les COV respectent les critères d'usage.</p> <p>2. Traités sur place ou dans un lieu de traitement autorisé.</p> <p>3. Éliminés dans un lieu d'enfouissement visé par le RESC.</p>
<p><b>≥ annexe I du RESC</b></p> <p>1. Décontaminés sur place ou dans un lieu de traitement autorisé et gestion selon le résultat obtenu. Si cela est impossible, éliminés dans un lieu d'enfouissement visé par le RESC pour les exceptions mentionnées à l'article 4.1° a, b ou c.</p>
<p><b>Cas particuliers</b></p> <p>1. Des sols contaminés peuvent être utilisés, à condition de ne dégager aucune odeur d'hydrocarbures perceptible, pour la construction d'un écran visuel ou antibruit dont l'utilité est démontrée :</p> <p>a. Sur un terrain résidentiel avec des sols du terrain d'origine :</p> <p>i. dont les concentrations sont ≤ B;</p> <p>ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols contiennent des concentrations ≤ B en C<sub>10</sub>-C<sub>50</sub> et en composés organiques volatils (COV)<sup>4</sup>;</p> <p>iii. dont les concentrations sont &lt; annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient de niveau &gt; C et que les sols déposés contiennent des concentrations ≤ B en C<sub>10</sub>-C<sub>50</sub> et en COV<sup>4</sup>;</p>

b. Sur un terrain commercial/industriel avec des sols du terrain d'origine :

- i. dont les concentrations sont  $\leq C$ ;
  - ii. dont les concentrations sont  $\leq C$ , lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement;
  - iii. dont les concentrations sont  $<$  annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient  $> C$ , et que les sols déposés contiennent des concentrations  $\leq C$  en  $C_{10}$ - $C_{50}$  et en  $COV^4$ .
2. La valorisation de sols contaminés dans un procédé en remplacement d'une matière vierge est possible aux conditions de l'autorisation.
  3. Les sols  $\geq B$  peuvent être acheminés sur les aires de résidus miniers, s'ils sont contaminés exclusivement par des métaux ou métalloïdes résultant des activités minières de l'entreprise responsable de l'aire, aux conditions de l'autorisation délivrée par le Ministère (article 6 du RSCTSC).
  4. Les sols  $\geq B$  peuvent être acheminés dans un lieu de dépôt définitif de matières dangereuses aux conditions du certificat d'autorisation détenu par ce lieu pour recevoir des sols.

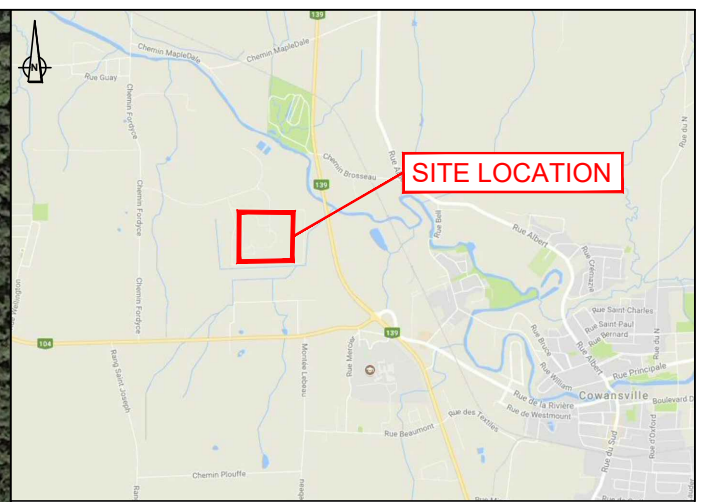
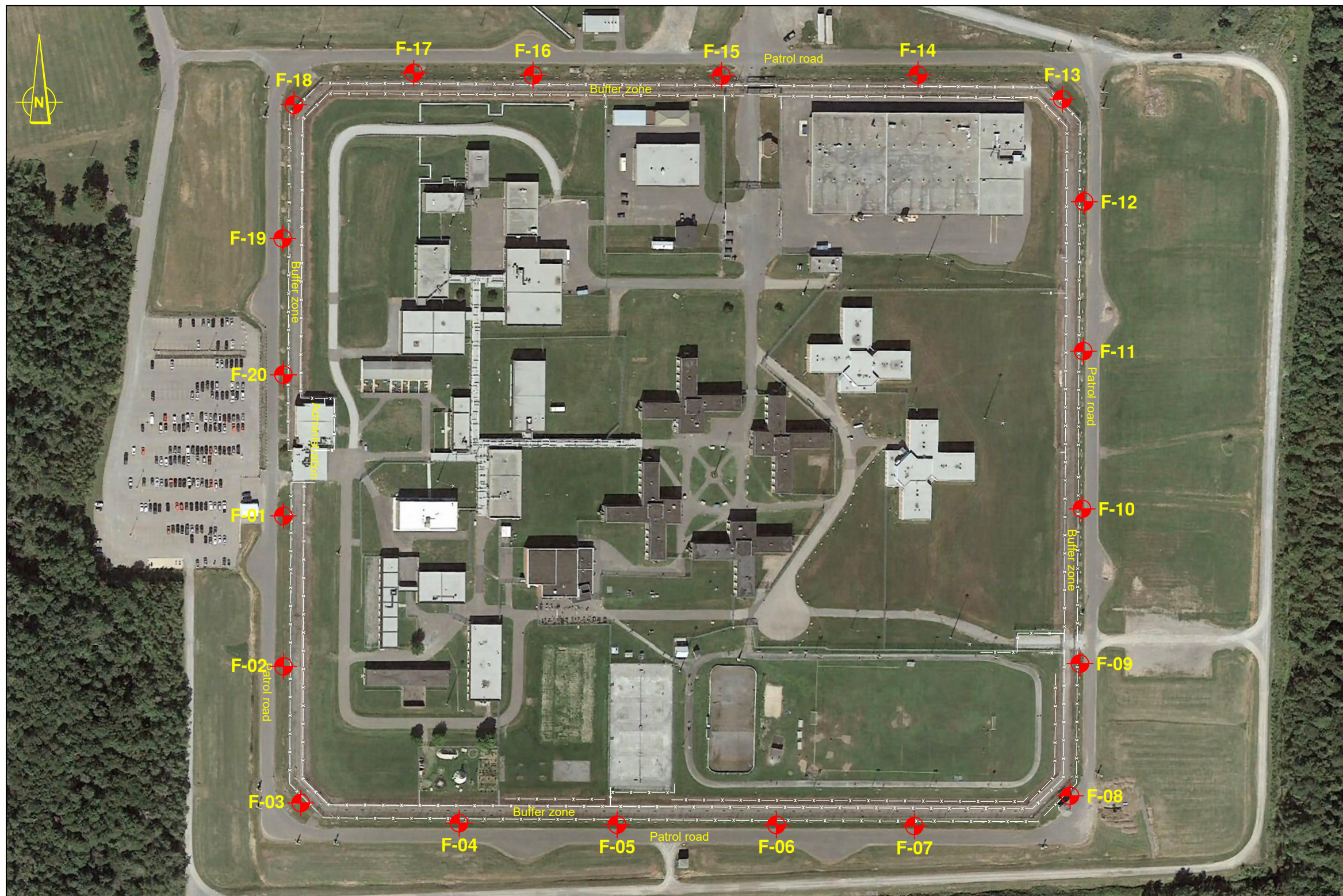
**Note :** S'il y a présence de matières résiduelles dans les sols, se référer à la figure 12 de la section 7.7.2.

1. S'il est établi que la concentration naturelle dans le sol importé est supérieure au critère A et à la concentration du sol récepteur, il est recommandé au propriétaire du terrain récepteur de garder une trace du remblayage (localisation, niveau de contamination, provenance des sols importés), de façon à ce qu'il puisse, le cas échéant, démontrer qu'il ne s'agit pas d'une contamination anthropique. Faute de l'existence d'une telle trace, le Ministère considérera que les sols ont été contaminés par l'activité humaine et ils devront donc être gérés comme tels. Advenant le cas où les concentrations naturelles excèdent largement les critères génériques recommandés pour l'usage qui est fait du terrain récepteur, un avis sur les possibles risques à la santé et l'à-propos du remblayage avec de tels sols pourra être demandé à la direction de santé publique.
2. Ne s'applique pas aux sols contaminés = B, à moins que ces sols n'aient d'abord transité par un lieu visé à l'article 6 du Règlement sur le stockage et les centres de transfert de sols contaminés. Les sols excavés  $\geq B$  ne peuvent en effet être acheminés directement que dans des lieux légalement autorisés à les recevoir et listés à l'article 6 du RSCTSC.
3. Il faudra toutefois s'assurer que la valorisation de sols A-B, auxquels on aura ajouté des matières fertilisantes ou non, entraîne un effet bénéfique, par exemple, sur la croissance de la végétation, et que ces sols répondent à un besoin réel, l'ajout de sols n'étant pas essentiel dans tous les cas de restauration minière. Il sera possible de s'assurer du bien-fondé du projet de valorisation et de son contrôle dans le cadre du certificat d'autorisation délivré préalablement à sa réalisation.
4. L'écran visuel ou antibruit doit être recouvert de 1 m de sols  $\leq A$  ou de 40 cm  $\leq A$  aux endroits recouverts d'une structure permanente (asphalte ou béton). Il est possible d'utiliser des MRF dans la couche apte à la végétation selon les orientations du *Guide sur l'utilisation des matières résiduelles fertilisantes pour la restauration de la couverture végétale des lieux dégradés* si la résultante est  $\leq A$ .

## Appendix 6

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Drawing – Borehole Locations



KEY PLAN

**LEGEND:**

- F-01**  
 Borehole and number
- New fence as provided by Tetra-Tech QI Inc.

**NOTE:**

This drawing originates from Google Earth Pro satellite photo database. The position of the boreholes on the photo is imprecise, notably due to certain photographic distortions. For the precise placement of the boreholes, reference to the table of coordinates is recommended.



CLIENT: Tetra-Tech QI Inc.

PROJECT: Replacement of the perimeter fence at the Cowansville Correctional Facility

LOCATION: 400 Fordyce Road  
Cowansville, Quebec

TITLE: Location of boreholes

SCALE: 1 : 2 500

DATE: December 2017 FILE: 649001 DIV. 00 DRAWING: 1 of 1

Borehole N°	MTM COORDINATES - NAD 83		GEODETTIC GROUND SURFACE ELEVATION (m)	Borehole N°	MTM COORDINATES - NAD 83		GEODETTIC GROUND SURFACE ELEVATION (m)	Borehole N°	MTM COORDINATES - NAD 83		GEODETTIC GROUND SURFACE ELEVATION (m)
	EASTING (m)	NORTHING (m)			EASTING (m)	NORTHING (m)			EASTING (m)	NORTHING (m)	
F-01	360 682.2	5 008 949.4	112.99	F-08	361 134.6	5 008 788.5	106.46	F-15	360 934.3	5 009 202.5	108.34
F-02	360 682.4	5 008 862.9	112.40	F-09	361 140.3	5 008 864.4	106.37	F-16	360 825.7	5 009 202.7	110.47
F-03	360 692.2	5 008 784.3	112.21	F-10	361 141.4	5 008 953.4	106.07	F-17	360 757.2	5 009 204.1	111.74
F-04	360 783.4	5 008 772.7	111.42	F-11	361 142.2	5 009 044.1	105.44	F-18	360 688.3	5 009 185.8	113.68
F-05	360 874.1	5 008 771.8	109.97	F-12	361 142.7	5 009 130.0	104.97	F-19	360 681.9	5 009 108.9	114.07
F-06	360 965.7	5 008 771.7	108.51	F-13	361 130.2	5 009 188.9	105.70	F-20	360 682.3	5 009 030.6	113.54
F-07	361 045.1	5 008 771.1	107.14	F-14	361 047.1	5 009 203.1	106.01				



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