Public Works and Government Services Canada

Requisition No: EZ899-182351/A

DRAWINGS & SPECIFICATIONS
for
MISSION INSTITUTION, MEDIUM -
PERIMETER ROAD UPGRADES
MISSION, B.C.

Project No. R. 065485.001 December 2017

APPROVED BY:

Regional Manager, AES — Date: 2017-12-13

Construction Safety Coordinator — Date: 2017-12-11

TENDER:

Project Manager — Date: 2017-12-11

Real Property Services Branch, Professional and Technical Services, Pacific Region
Room 219 - 800 Burrard Street, Vancouver, B.C., V6Z 0B9

ENGINEERS – SEAL & SIGNATURE

Seal / Signature / Date

2017-12-11

SPECIFICATIONS

DRAWINGS

APPENDICES

Golder Associates; Geotechnical Investigation; Perimeter Road Improvements Mission Institution Mission, BC (Golder Report Number: 1114470264-020-R-Rev0 7000); October 31, 2013.

Keystone Environmental Ltd; Mission Medium Institution Perimeter Road Repaving; Environmental Effects Evaluation; November 2017.

END OF INDEX

1 SUMMARY OF WORK

.1 Work covered by Contract Documents and Location of the Work:

.1 Work under this Contract comprises perimeter road upgrades and site work including;

- Protection of the eastern wetland area from siltation and contamination during the construction of the works, in accordance with the requirements of the Environmental Report.
- Reconstruction of storm drainage crossings below the east portion of the perimeter road.
- Restoration, reconstruction and overlay of existing pavements as described in the Geotechnical Investigation Report and drawings.
- Compliance with one-month waiting period between placing the additional road-raising base granular layer on the east portion of the perimeter road and construction of the lower course of the asphalt pavement riding surface to allow for potential settlements to occur before paving.
- Proposed base granular layer on the east portion of the perimeter road is to be maintained for vehicular use for the duration of the one-month waiting period referred to above and fine grading repeated before construction of the lower course of the asphalt pavement riding surface.
- Vertical and Horizontally realignment of eastern portion of the perimeter road and adjacent storm drainage ditch.
- Tie-ins, miscellaneous removals and repairs, curb replacements and extensions and restoration of pavement markings.

.2 The work is located at the Mission Institution, Medium at 8751 Stave Lake Street, Mission, British Columbia, V2V 4L8.

.2 Contractor's Use of Premises:

.1 Use of site is limited to work areas required for the work, including the storage of materials and equipment and to the access routes assigned by Mission Institution required for the completion of work as specified. Contractor has use of the work areas until Substantial Completion:

.1 Contractor use of premises for storage and access, as approved by the Departmental representative.

.2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.2 Vehicular access through the Sally Port will not be required. Other access, if needed will be restricted during the inmate "count" at breakfast, lunch and dinner hours. Confirm times with Departmental Representative. Delays may occur when entering and exiting the Institution with vehicles due to security situations and heavy traffic.

.3 A minimum of one-way traffic flow is to be maintained at all times along the west, north and south portions of the perimeter road. Whenever the east portion of the perimeter road requires closure (subject to approval of the Departmental Representative), 360 degree turning is to be provided and maintained for patrol vehicles at the north east and south east corners of the perimeter road circuit; such turning is to be in a single turn movement or in no greater than a two point movement (.i.e forward – reverse – forward).

.4 The Contractor shall at all times implement and maintain adequate traffic control in general accordance with applicable sections of the "Traffic Management Manual for Work on Roadways" 2015 Office Edition published by the British Columbia Ministry of Transportation and Infrastructure. The Contractor shall provide the required traffic cones,

arrow boards, signs, flashes, barricades etc., as well as qualified flag persons and staff, as may be required.

.5 All excavations are to be permanently or temporarily restored or fully covered over with highway-rated steel road plates by the end of every work day.

.6 Cooperate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative. Provide access to the work areas as required for the Departmental Representative to perform their duties

.7 Coordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of this Work.

2 WORK RESTRICTIONS

.1 Notify, Departmental Representative of intended interruption of power, communication and water services and provide schedule of interruption times.

.2 Where Work involves breaking into or connecting to existing services, give departmental Representative 7 days of notice for necessary interruption of services throughout course of work. Keep duration of interruptions to a minimum. Coordinate interruptions with local authority having jurisdiction and local residences and businesses affected by the disruption.

.3 Provide for access by pedestrian and vehicular traffic on and around site where work is in progress.

.4 Construct barriers in accordance with Section Temporary Barriers and Enclosures.

.5 Security Requirements: refer to Section 01 14 10 - Security Requirements.

.6 Hours of work:

.1 Perform work during normal working hours of the Institution (0730 to 1600), Monday through Friday except holidays.

.2 Work may be performed after normal working hours of the Institution, Monday through Friday, on weekends and holidays.

.3 Notify Departmental Representative eight hours in advance of when after hours work will be required.

.4 Provide construction schedule for prior approval of Departmental Representative.

3 CONSTRUCTION WORK SCHEDULE

.1 Commence work immediately upon official notification of acceptance of offer and complete the work by March 15, 2018.

.2 Award of Contract rate of progress, Substantial Certificate and Final Certificate as defined times of completion are of the essence of this contract.

.3 Submittal:

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

.2 Identify each trade or operation.
.3 Show dates for delivery of items requiring long lead time.
.4 Departmental Representative will review schedule and return one copy.
.5 Re-submit two (2) copies of finalized schedule to Departmental Representative within five (5) working days after return of reviewed preliminary copy.

.4 Project Scheduling Reporting:
.1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.
.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

.5 Project Meetings:
.1 Provide senior level attendance at Project meetings (up to once per 2 weeks, called by the Departmental Representative). 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. Progress meeting minutes to be prepared by the Contractor for distribution by the Departmental Representative.
.2 Weather related delays with their remedial measures will be discussed and negotiated.
.3 Before submitting first progress claim submit breakdown of Contract price in detail as directed by Departmental Representative and aggregating contract price. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.

4 SUBMITTAL PROCEDURES

.1 Certificates and Transcripts:
.1 Immediately after award of Contract, submit WorkSafe BC status or clearance letter.
.2 Submit transcription of insurance immediately after award of Contract.
.3 Administrative:
.1 Submit to Departmental Representative submittal listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
.2 Work affected by submittal shall not proceed 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 submittal 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. Submittal not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
.7 Verify field measurements and affected adjacent Work are coordinated.

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

.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.

.4 Shop Drawings:

.1 The term “shop drawings” means drawings, diagrams, illustrations, schedules, performance charts, brochures, cut sheets from manufacturers’ literature and other data which are provided by the Contractor to illustrate or describe details of a portion of the work.

.2 Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate sections.

.5 Product Data:

.1 Certain specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings, provided that the product concerned is clearly identified. Submit in sets, not as individual submissions.

.6 Progress Photographs:

.1 Provide construction photographs in accordance with procedures and submission requirements specified in this clause.

.2 Progress Photographs:

.1 Provide digital photographs with images of minimum 3.1 megapixel resolution and stored in Jpeg format with minimal compression.

.2 Number of viewpoints: four (4), locations of viewpoints directed by Departmental Representative.

.3 Frequency: monthly, submitted on disk with monthly progress statement, sent via e-mail or as directed by Departmental Representative.

.4 Identify photos by location, date and sequential numbering system.

.3 Final Photographs:

.1 Provide digital photographs with images of minimum 3.1 megapixel resolution and stored in Jpeg format with minimal compression. Where photos are e-mailed compression can be increased.

.2 Number of viewpoints:

.1 At least 10 per day evenly spaced views of trenched works, restoration and pavement construction in progress.

.2 Additional locations of viewpoints determined by Departmental Representative.

.3 Submit final photographs in digital format on CD, before final acceptance.

.4 Label disks and identify with name and project number of project. Indicate exposure dates and viewpoints of each photo and photo number.

.7 Submission Requirements:

.1 Schedule submissions at least ten days before dates reviewed submissions will be needed.

.2 Submit number of copies of product data, shop drawings which Contractor requires for distribution plus four (4) copies which will be retained by Departmental Representative.

.3 Accompany submissions with transmittal letter in duplicate.
.4 Submit either bond copies or one (1) reproducible transparency as directed by Departmental Representative.

.8 Coordination of Submissions:
.1 Review shop drawings, product data and samples prior to submission.
.2 Coordinate with field construction criteria.
.3 Verify catalogue numbers and similar data.
.4 Coordinate each submittal with requirements of the work of all trades and contract documents.
.5 Responsibility for errors and omissions in submittal is not relieved by Departmental Representative's review of submittal.
.6 Responsibility for deviations in submittal from requirements of Contract documents is not relieved by Departmental Representative's review of submittal, unless Departmental Representative gives written acceptance of specified deviations.
.7 Notify Departmental Representative, in writing at time of submission, of deviations in submittal from requirements of Contract documents.
.8 Make any changes in submissions which Departmental Representative may require consistent with Contract Documents and re-submit as directed by Departmental Representative.
.9 After Departmental Representative's review, distribute copies.
.10 Shop Drawings Review:
.1 Review of shop drawings by Public Works and Government Services Canada (PWGSC) is for the sole purpose of ascertaining conformance with the general concept.
.2 The Departmental Representative’s review does not mean that PWGSC approves the detail design inherent in the shop drawings, responsibility remains with the contractor submitting same, and such review will not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents.
.3 Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for co-ordination of the work of all subtrades.

5 LAYOUT OF THE WORK

.1 The Contractor is responsible for construction layout and will include in his costs to employ a competent surveyor to establish layout, lines and grades under this contract. Before construction, the Contractor shall check the drawings and the layout for errors or omissions. If an error, omission or conflicting information is found on the drawings, the Contractor shall immediately notify the Consultant and request further instructions.

.2 The Contractor will also carry out all calculations required in order to lay out the works. AutoCAD based drawing files will be made available to the Contractor to obtain coordinates, distances, angles, bearings and locations relative to established site survey control.

.3 It is the Contractor’s responsibility to check that each proposed service can be installed in accordance with the lines, elevations and grades indicated on the drawings without conflict with other existing or proposed services before commencing the installation of

the proposed service and to inform the departmental representative of any conflicts. All costs of locating, protecting or repairing existing services shall be borne by the Contractor.

.4 Notify Departmental Representative immediately if the work cannot be completed as shown in the plans and specifications.

6 REQUIRED DOCUMENTS

.1 Maintain one copy at job site:
- .1 Contract drawings, Safety Plan and Waste Reduction Workplan.
- .2 Specifications.
- .3 Addenda
- .4 Change orders
- .5 Other modifications to contract
- .6 Copy of approved work schedule
- .7 Health and Safety plan.
- .8 Environmental Emergency Response Plan

7 SITE AND GROUND CONDITION AND DATA

.1 Make inquiries or investigations necessary to become thoroughly acquainted with site, soil, surface, stream and road access and servicing conditions, and the nature and extent of the work.

.2 Submission of a tender will be deemed confirmation that the Contractor is acquainted with the site and is conversant with all relevant conditions.

.3 Refer to Golder Associates; Geotechnical Investigation; Perimeter Road Improvements Mission Institution Mission, BC (Golder Report Number: 1114470264-020-R-Rev0 7000); October 31, 2013, for general ground conditions and nature of pavement improvements required. For the pavement improvements on the east section of the perimeter road, Option 3 in the Geotechnical Investigation Report is being used for this project.

8 HEALTH AND SAFETY

.1 Specified in Section 01 35 33.

9 ENVIRONMENTAL PROCEDURES

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

.2 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.

.3 Do not dispose of waste or volatile materials such as oil, paint thinner or mineral spirits into waterways, storm or sanitary systems.

.4 Provide temporary drainage and pumping as necessary to keep excavations and site free from water during excavation and grading activities.

.5 Control disposal of run-off of water containing suspended materials or other harmful substances in accordance with local authority requirements. Construct settlement ponds and silt fences as required by the Provincial Environmental authority.

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

.7 Under no circumstances dispose of rubbish or waste materials on adjoining property.

.8 Become familiar with the conditions described within and comply fully with the requirements and recommendations of the Keystone Environmental Ltd; Mission Medium Institution Perimeter Road Repaving; Environmental Effects Evaluation; November 2017. The Contractor is responsible for providing all temporary measures and works as may be required to achieve compliance and all professional services necessary to verify compliance and perform salvages of fish and other species.

10 CONTRACT METHOD, MEASUREMENT & PAYMENT

.1 Conduct Work under stipulated price (lump sum) contract.

.2 Depths of road restoration required at each location will be dependent on conditions revealed by exposure as the Contractor's work proceeds. Competent substructure or subgrade will require to be approved by the Departmental Representative (geotechnical) on a case by case basis before completing installation of restoration layers. At all areas shown (on drawings) to require road restoration, the Contractor's lump sum price is deemed to allow for full depth restoration as per pavement restoration details 1 and 2 on Drawing C1, inclusive of an average 200mm depth of subgrade removal and replacement. Should the Departmental Representative (geotechnical) authorize a reduced depth of restoration, a suitable reduction in the Contract Price is to be calculated to account for the reduced scope of work.

.3 In some cases the width of restoration areas shown on drawings may be insufficient to enable full depth restoration. Should additional restoration width be required, this is deemed to have been identified by the Contractor at tender stage and allowed for in his lump sum price.

.4 The Contractor's lump sum price is deemed to allow for an additional 10% of road restoration detail 1 (drawing C1) and an additional 5% of road restoration detail 2 (drawing C1) over and above the areas of road restoration measured from drawings. This will provide an allowance should additional road restoration requirements come to light during the contract, up to 10% and 5% of details 1 and 2 respectively. Should any portion of the additional 10% or 5% allowances not be required to remediate additional areas, a suitable reduction in the Contract Price is to be calculated to account for the unused allowance.

.5 It is not possible to accurately show on drawings the extent of crack sealing required. The crack sealing symbols shown on drawings indicate the general areas of cracks requiring sealing. Multiple branches of the same crack or group of cracks are not shown on drawings. The Contractor is deemed to have reviewed the site conditions during the tender period and accepted in full the risk associated with any assumptions made by the Contractor regarding the quantity of crack sealing necessary. No additional payment to the Contractor will be considered should the quantity of crack sealing exceed that

implied by the drawings or assumed by the Contractor at tender stage.

.6 Relations and responsibilities between Contractor and Subcontractors are as defined in Conditions of Contract. Assigned subcontractors must in addition:

.1 Furnish to the Contractor, bonds covering faithful performance of the subcontracted work and payment of obligations thereunder when Contractor is required to furnish such bonds to the owner.

.2 Purchase and maintain liability insurance to protect from claims for not less than limits of liability which Contractor is required to provide to the Owner.

11 QUALITY CONTROL

.1 Inspection:

.1 Provide access to the work areas as required for the Departmental Representative to perform their duties. 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.

.2 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.

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

.2 Independent Inspection Agencies:

.1 Provide independent Inspection/Testing Agencies for purpose of inspecting and/or testing portions of Work as specified in relevant sections. Cost of such services will be paid for under the contract.

.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 extra cost to Contract. Pay costs for retesting and reinspection.

.3 Procedures:

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

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

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

.4 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.

.5 Reports:

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

.6 Tests and Mix Designs:

.1 Furnish test results and mix designs as may be requested.

12 TEMPORARY UTILITIES

.1 Installation and Removal:

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

.2 Remove from site all such work after use.

.2 Dewatering:

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

.3 Water Supply:

.1 Arrange, pay for and maintain temporary water supply in accordance with local authority, governing regulations and ordinances.

.2 Permanent water supply system installed under this contract may be used subsequent to approved tie-in for construction requirements provided that guarantees are not affected thereby. Replace damaged components.

.4 Temporary Power and Light:

.1 Arrange, pay for and maintain temporary electric power supply in accordance with local power authority governing regulations and ordinances.

.2 Electrical power and lighting installed under this contract may be used for construction purposes at no extra cost, provided that guarantees are not affected thereby and electrical components used for temporary power are replaced when damaged.

.3 Replace lighting bulbs/tubes and clean reflectors and lenses used for more than three months.

.5 Temporary Communication Facilities:

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

.6 Fire Protection:

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

13 CONSTRUCTION FACILITIES

.1 Installation and Removal:
- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

.2 Scaffolding:
- .1 Design, construct and maintain scaffolding in rigid, secure and safe manner, in accordance with WCBBC regulations and Section 01 35 33.
- .2 Erect scaffolding independent of walls. Remove promptly when no longer required.

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

.4 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 a weight or force that will endanger the Work.

.5 Construction Parking:
- .1 Make good damage to existing roads used for access to project site.
- .2 Build and maintain temporary access where required and provide snow removal during period of Work.
- .3 Park vehicles outside perimeter fence in designated parking areas.

.6 Contractor's Site Office and enclosure:
- .1 Provide office of size to accommodate site meetings and Contractor's operations.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Provide temporary fenced area to enclose site and operations.

.7 Equipment, Tools and Material Storage:
- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

.8 Sanitary Facilities:
- .1 Provide portable washrooms for work force and visitors to the construction site.

.9 Construction Signs:
- .1 Format, location and quantity of site signs and notices to be approved by Departmental Representative.
- .2 Signs and notices for safety or instruction to be in English language, or commonly understood graphic symbols.
- .3 Maintain signboards, signs and notices for duration of project. Remove and dispose of signs off site when directed by Departmental Representative.
- .4 Contractor signboard identifying Prime Contractor and subcontractors to be

erected and paid for by Contractor.

.5 Remove signs from site at completion of project or as directed by Departmental Representative.

14 TEMPORARY BARRIERS AND ENCLOSURES

.1 Guardrails and Excavations:

.1 Provide secure, rigid guard rails and barricades around deep excavations, open edges of floors and roofs etc.

.2 Provide as required by governing authorities.

.2 Access to Site:

.1 Maintain perimeter road, other institutional roads and immediate local access roads used in clean condition used during work of this contract. All work areas are to be swept clean before the completion of every work day as a minimum.

.3 Protection for Off-Site and CSC Property:

.1 Protect surrounding CSC property from damage during performance of Work.

.2 Be responsible for damage incurred.

.4 Protection of Building Finishes:

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

15 COMMON PRODUCT REQUIREMENTS

.1 Reference Standards:

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

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

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

.2 Quality:

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

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

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

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

.5 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

.3 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, 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.

.4 Transportation:

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

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

.5 Manufacturer’s Instructions:

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

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

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

.6 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.

.7 Co-ordination:

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

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

.8 Concealment:

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

.9 Remedial Work:

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

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

.10 Location of Fixtures:

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

.3 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

.11 Protection of Work in Progress:

.1 Prevent overloading of any part of works.

.12 Existing Utilities:

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to pedestrian and vehicular traffic.

.2 Before commencing work, establish location and extent of service lines in areas of work and notify Departmental Representative of findings.

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

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

.5 Record locations of maintained, capped and re-routed services lines.

.13 Contractors Options for Selection of Products:

.1 Products specified by **"Prescriptive" specifications**: select any product meeting or exceeding specifications.

.2 Products specified under **"Acceptable Products"** (used for complex Mechanical or Electrical Systems): select any one of the indicated manufacturers. Alternate products meeting or exceeding the Prescriptive specifications and indicated Products are acceptable only if approved by addendum during the tender period.

.3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.

.4 Products specified to meet particular design requirements or to match existing materials: use only material specified Approved Product. Alternate products meeting or exceeding the stated requirements and indicated Products are acceptable only if approved by addendum during the tender period.

.5 When products are specified by a referenced standard or by Performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.

.14 Substitution after award of Contract:

.1 No substitutions are permitted without prior written approval of the Departmental Representative.

.2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.

.3 Proposals will be considered by the Departmental Representative if:

.1 products selected by tenderer from those specified are not available;

.2 delivery date of products selected from those specified would unduly delay completion of Contract, or

.3 alternative product to that specified, which is brought to the attention of and considered by Departmental Representative as equivalent to the product specified, and will result in a credit to the Contract amount.

.4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the project. Pay for design or drawing changes required as result of substitution.

.5 Amounts of all credits arising from approval of the substitutions will be determined by the Departmental Representative, and the Contract price will be reduced accordingly.

16 EXAMINATION AND PREPARATION

.1 Existing Services:

.1 The existing services shown on the drawings have been located from record drawings and are not guaranteed to be accurate or complete. It is the responsibility of the Contractor to review all available records, locate all existing services such as water, gas, electricity, telephone, sewers, drains, and culverts, to preserve and protect services from damage during construction, and record the type, diameter, invert elevation and direction of each crossing encountered during trenching. Work shall be planned and executed such that there is no interruption of service provided by these utilities without the prior receipt of the approval of the authorities responsible for the operation and maintenance of these utilities. Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Cap or otherwise seal lines at cut-off points as indicated on the drawings.

.2 Location of Equipment and Fixtures:

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

17 EXECUTION REQUIREMENTS

.1 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 may be exposed by uncovering work; maintain excavations free of water.

.2 Execution:

.1 Execute cutting, fitting, and patching 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 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials including final cutting of road pavements using purpose made saw or core drill. Pneumatic or impact tools not allowed on brittle materials without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

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

.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.

.12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

.13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

18 CLEANING

.1 Project Cleanliness:

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

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

.3 Clear snow and ice from access to building.

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

.5 Provide and use clearly marked separate bins for recycling. Refer to-Construction/Demolition Waste Management And Disposal.

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

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

.8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

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

.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.2 Final Cleaning:

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

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

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

.4 Remove waste products and.

.5 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.7 Clean lighting reflectors, lenses, and other lighting surfaces.

.8 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.9 Wax, seal, vacuum clean, shampoo or prepare floor finishes, as recommended by manufacturer.

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

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

.12 Remove dirt and other disfiguration from exterior surfaces.

.13 Sweep and wash clean paved areas.

.14 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

.15 Clean roofs, downspouts, and drainage systems.

.16 Remove snow and ice from access to building.

19 CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL

.1 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and/or recyclable materials and waste.

.1 Separate non-salvageable materials from salvaged items.

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

.3 Transport and deliver non-salvageable items to licensed disposal facility.

.2 Provide containers to deposit reusable and/or recyclable materials. Locate containers in locations, to facilitate deposit of materials without hindering daily operations. Provide containers to deposit reusable and/or recyclable materials.

.3 Collect, handle, store on-site and transport off-site, salvaged materials in separate condition. Transport to approved and authorized recycling facility and/or users of material for recycling.

.4 Locate waste and salvage bins on site as directed by Departmental Representative.

20 CLOSEOUT PROCEDURES

.1 Inspection and Declaration:

.1 Contractor's Inspection: Conduct an inspection of Work with all subcontractors, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.2 Notify Departmental Representative in writing of satisfactory completion of Contractor's

Inspection and that corrections have been made.

.3 Request Departmental Representative's Inspection.

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

.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Certificates required by HRSDC Fire Protection Engineering and Utility companies have been submitted.

.5 Operation of systems have been demonstrated to Departments personnel.

.6 Work is complete and ready for Final Inspection.

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

21 CLOSEOUT SUBMITTAL

.1 Record Drawings:

.1 As work progresses, maintain accurate records to show all deviations from the Contract Drawings and record the type, diameter, invert elevation and direction of each crossing encountered during trenching. Note on as-built drawings as changes occur. At completion supply:

.1 One (1) set of CD's in AutoCad file format (version: 2007 or later) with all as-built information on the diskettes.

.2 One (1) set of as-built plotted reproducible drawings.

.3 Four (4) sets of printed as-built drawings.

.4 Submit one copy of check plots to Departmental Representative prior to final printing of as-built drawings.

.5 Departmental Representative will supply copies of the original AutoCad files.

.6 Retain original logo and title block on the as-built drawings. Contractor may place on the upper right-hand title block area a small company logo, the text "AS-BUILT" and the date.

.2 Costs for transferring as-built information from marked up working set of drawings to electronic format using ACAD and plotting service is included in the Contract.

.2 Maintenance manual:

.1 On completion of project submit to Departmental Representative three (3) CD R/ disk copies and one paper (in loose leaf type binder) of Operations and Maintenance Manual, made up as follows:

.1 Provide maintenance manual on CDs using pdf, or other approved format for descriptive writing, page size images and page size drawings. Organize manuals into industry standard maintenance manual tabs with links in index to each descriptive section describing the component or maintenance procedure etc.

.2 Organize files into CSI Masterformat numbering system or other approved descriptive titles.

.3 Label disk "Operation and Maintenance Data", project name, date, names of Contractor, subcontractors, consultants and subconsultants.

.4 Include scanned guarantees, diagrams and drawings.

.5 Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labeled tabs (navigational buttons).

.6 Drawings, diagrams and manufacturer's literature must be legible.

.7 Refer to Mechanical and Electrical Divisions for specific details for Mechanical and Electrical data.

.3 Maintenance Materials, Special Tools and Spare Parts:

.1 Specific requirements for maintenance materials, tools and spare parts are specified in individual sections.

.2 Deliver maintenance materials, special tools and spare parts to Departmental Representative and store in designated area as directed by Departmental Representative.

.3 Prepare lists of maintenance materials, special tools and spare parts for inclusion in Manual specified in Clause 18.2.

.4 Maintenance materials:

.1 Deliver wrapped, identify on carton or package, colour, room number, system or area as applicable where item is used.

.5 Special tools:

.1 Assemble as specified;

.2 Include identifications and instructions on intended use of tools.

.6 Spare parts:

.1 Assemble parts as specified;

.2 Include part number, identification of equipment or system for which parts are applicable;

.3 Installation instructions;

.4 Name and address of nearest supplier.

.4 Warranties and Bonds:

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

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

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

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

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

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

22 DEMONSTRATION AND TRAINING

.1 Demonstration and Training:

.1 Demonstrate operation and maintenance of equipment and systems to maintenance personnel following interim Completion and prior to date of final certificate of completion

.2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

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:
(a) an intoxicant, including alcoholic beverages, drugs and narcotics
(b) 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,
(c) an explosive or a bomb or a component thereof,
(d) currency over any applicable prescribed limit, $25.00, and
(e) 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 and related Items” means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing 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 representative defined in General Conditions.

.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 indicated in the contract documents, that the contractor will be allowed to work". This area may or may not be isolated from the security area of the institution. Limits to be confirmed at construction start-up meeting.

3 PRELIMINARY PROCEEDINGS

.1 At construction start-up meeting:
.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’s responsibilities:
.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 Departmental Representative 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 10 working days 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 this institution except as approved otherwise.

.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 must have windows closed; fuel caps locked, doors and trunks locked and keys removed. The keys must 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 will require security clearances and 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 PWGSC Construction Escorts while in the Institution.

.4 If the Director permits trailers to be left inside the secure perimeter of the Institution, the trailer doors must be locked at all times. All windows must be securely locked bars when left unoccupied. Cover all windows with expanded metal mesh. When not in use lock all storage trailers located inside and outside the perimeter. 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 To avoid confusion with the institution's own shipments, address all shipments of project material, equipment and tools in the Contractor’s name and have a representative on site to receive any

deliveries or shipments. CSC or PWGSC staff will **NOT** accept receipt of deliveries or shipments of any material equipment or tools for the contractor.

8 TELEPHONES

.1 The installation of telephones, facsimile machines and computers with Internet connections is not permitted within the Institution perimeter unless prior approved by the Director.

.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, PDAs, telephone used as 2-way radios are not permitted within 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 2-way radios.

9 WORK HOURS

.1 Work hours within the Institution are described in specification section 01 01 50.

.2 Work is not 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 may be waved by the Director.

10 OVERTIME WORK

.1 Conform to Division 1.

.2 Provide 48 hours advance notice to Director for all work to be performed after normal working hours of the Institution. Notify Director immediately if emergency work is required, such as to complete a concrete pour or make the construction site safe and secure.

11 TOOLS AND EQUIPMENT

.1 Maintain a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required by the Institution.

.2 Throughout the construction project maintain up-to-date the 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. Secure and lock scaffolding when not erected and when erected Secure in a manner agreed upon with the Institution designate.

.6 Report all missing or lost tools or equipment immediately to the Departmental Representative/Director.

.7 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 work day or shift upon entering and exiting the Institution.
- .2 At any time when contractor is on Institution property.

.8 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. Maintain up to date inventory of all used blades/cartridges.

.9 If propane or natural gas is used for heating the construction, the institution will require that the contractor supervise the construction site during non-working hours.

12 KEYS

.1 Security Hardware Keys.
- .1 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 Provide a copy of the receipt to the Departmental Representative.

.2 Other Keys
- .1 Use standard construction cylinders for locks for his use during the construction period.
- .2 Issue instructions to 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 PWGSC construction escort will 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 PWGSC 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 Smoking is not permitted inside correctional facilities or outdoors within the perimeter of a correctional facility and persons must not possess unauthorized smoking items within the perimeter of a correctional facility.

.2 Persons 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 permitted outside the perimeter of a correctional facility in an area 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, 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 Construction vehicles are not to leave the Institution until an inmate count is completed. Escorted commercial vehicles will be allowed to enter or leave the institution through the vehicle access gate during the following hours:
.1 AM: 0745 hrs. to 1100 hrs.
.2 PM: 1300hrs. to 1530 hrs.

.2 The contractor will 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 PWGSC construction escorts 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 will 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. Arrange with Director for parking of contractor's vehicles at minimum security Institutions.

.6 Private vehicles of construction employees will not be allowed within the security wall or fence of medium or maximum security institutions without the authorization of the Director.

.7 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 solid 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 accompanied by a member of the CSC security staff or PWGSC Construction Escort Officer.

.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 Institution cafeteria and dining room.

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

.2 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 employee doing any of the above will be removed from the site and his security clearance revoked.

.2 Digital cameras (or any other type) are not allowed on CSC property.

.3 Notwithstanding the above paragraph, if the director approves of the use 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

1.1 References

.1 Government of Canada.
- .1 Canada Labour Code - Part II
- .2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):
- .1 Part 8, Safety Measures at Construction and Demolition Sites.

.3 Canadian Standards Association (CSA) as amended:
- .1 CSA Z797-2009 Code of Practice for Access Scaffold
- .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
- .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures

.4 Fire Protection Engineering Services, HRSDC:
- .1 FCC No. 301, Standard for Construction Operations.
- .2 FCC No. 302, Standard for Welding and Cutting.

.5 Province of British Columbia:
- .1 Workers Compensation Act Part 3-Occupational Health and Safety.
- .2 Occupational Health and Safety Regulation

.6 National Research Council Canada
- .1 NRCC-52715 “Safety and Waste Management of Asbestos Cement Pipes”

1.2 Related Sections

.1 Refer to the following sections as required:
- .1 General Instructions: Section 01 01 50 and all other contract specification sections

1.3 Workers' Compensation Board Coverage

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 Compliance with Regulations

1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.5 Submittals

.1 Submit to Departmental Representative submittals listed for review in accordance with Section 01 01 50.

.2 Work involving a submittal shall not proceed until review is complete.

.3 Submit the following:

.1 Health and Safety Plan.

.2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.3 Copies of incident and accident reports.

.4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.

.5 Emergency Procedures.

.4 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.

.5 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.

.6 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:

.1 Be construed to imply approval by the Departmental Representative.

.2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.

.3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 Responsibility

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

.2 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 The Contractor is to assume the role of the “prime contractor” for the duration of the work.

1.7 General Conditions

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

1.8 Project/ Site

.1 Work at site will involve contact with:

Conditions

.1 Unknown buried utilities and infrastructure.
.2 Working adjacent to, cutting, removal, disposal and tying-into existing asbestos cement watermains.
.3 Excavations.
.4 Heavy machinery (if necessary).

1.9 Regulatory Requirements

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
.2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.10 Filing of Notice

.1 The Contractor is to complete and submit a Notice of Project as required by Provincial authorities.
.2 Provide copies of all notices to the Departmental Representative.

1.11 Health and Safety Plan

.1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
.2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
.1 Primary requirements:
.1 Contractor's safety policy.
.2 Identification of applicable compliance obligations.
.3 Definition of responsibilities for project safety/organization chart for project.
.4 General safety rules for project.
.5 Job-specific safe work, procedures.
.6 Inspection policy and procedures.
.7 Incident reporting and investigation policy and procedures.
.8 Occupational Health and Safety Committee/ Representative procedures.
.9 Occupational Health and Safety meetings.
.10 Occupational Health and Safety communications and record keeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
.3 List hazardous materials to be brought on site as required by work.
.4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
.5 Identify personal protective equipment (PPE) to be used by workers.
.6 Identify personnel and alternates responsible for site safety and health.
.7 Identify personnel training requirements and training plan, including site orientation for new workers.

.3 Develop the plan in collaboration with all subcontractors. Ensure that work/ activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.12 Emergency Procedures

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
- .1 Designated personnel from own company.
- .2 Regulatory agencies applicable to work and as per legislated regulations.
- .3 Local emergency resources.
- .4 Departmental Representative [site staff].

.2 Include the following provisions in the emergency procedures:
- .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
- .2 Evacuate all workers safely.
- .3 Check and confirm the safe evacuation of all workers.
- .4 Notify the fire department or other emergency responders.
- .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
- .6 Notify Departmental Representative.

.3 Provide written rescue/evacuation procedures as required for, but not limited to:
- .1 Work at high angles.
- .2 Work in confined spaces or where there is a risk of entrapment.
- .3 Work with hazardous substances.
- .4 Underground work.
- .5 Work on, over, under and adjacent to water.
- .6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

.5 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

1.13 Hazardous Products

1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:
- .1 Advise Departmental Representative beforehand of the

product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 01 50.

.2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.

.3 Provide adequate means of ventilation.

.3 Asbestos Cement Pipe: Removal, disposal and handling of asbestos cement pipe will be performed in accordance with National Research Council Canada guideline NRCC-52715 “Safety and Waste Management of Asbestos Cement Pipes”.

1.14 Fire Safety Requirements

.1 Store oily/ paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.15 Unforeseen Hazards

.1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

1.16 Posted Documents

.1 Post legible versions of the following documents on site:

.1 Health and Safety Plan.

.2 Sequence of work.

.3 Emergency procedures.

.4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.

.5 Notice of Project.

.6 Floor plans or site plans.

.7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.

.8 Workplace Hazardous Materials Information System (WHMIS) documents.

.9 Material Safety Data Sheets (MSDS).

.10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

.2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.

.3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.17 Meetings

.1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

1.18. Correction of Non-Compliance

.1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

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

.3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/ subcontractors will be responsible for any costs arising from such a "stop work order".

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 This section relates to civil concrete work, relevant to concrete walks, curbs and gutters and cast-in-place concrete associated with subsurface utility works, manholes, catchbasins, lawn drains, watermains, sewers and drainage.

.2 Building structure concrete is specifically excluded from the scope of this section.

1.2 RELATED SECTIONS

.1 Section 01 01 50 – General Instructions

.2 Section 32 16 15 – Concrete Walks, Curbs and Gutters

.3 Section 33 05 13 – Manholes and Catchbasin Structures

1.3 REFERENCES

.1 ASTM International

.1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.2 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.

.3 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

.3 CSA International

.1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 01 50 – General Instructions.

1.5 QUALITY ASSURANCE

.1 Provide to Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

.1 Quality Control Plan (QCP): provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements. The QCP is to include details of the sampling and testing of concrete in compliance with CSA-A23.1. The results of all testing are to be furnished to the Departmental Representative.

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.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Cement: to CSA A3001.

.2 Water: to CSA A23.1/A23.2.

.3 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.

.4 Welded steel wire fabric: to ASTM A185.

.5 Premoulded joint filler:

.1 Bituminous impregnated fibreboard: to ASTM D1751.

.6 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.

.7 Sealer: boiled linseed oil to ASTM D260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend.

.8 Waterstops: extruded ribbed PVC strips, 12MPa tensile strength, minimum 350% elongation, minus 45 to plus 80 degrees centigrade working temperature.

.9 Supplementary and other concrete materials: to CSA A23.1/A23.2.

2.4 MIXES

.1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 – FIELD QUALITY CONTROL.

.2 Intended application: Pavements, walks, curbs and gutters and exposed site concrete.

.1 Uniformity and workability: free of surface blemishes, loss of mortar, colour variations, segregation.

.2 Durability and class of exposure: C-2.

.3 Compressive strength at 28 days: 32 MPa minimum.

.4 Nominal maximum aggregate size 20 mm.

.3 Intended application: Subsurface civil works.

.1 Uniformity and workability: free of loss of mortar, segregation.

.2 Durability and class of exposure: C-4.

.3 Compressive strength at 28 days: 25 MPa minimum.

.4 Nominal maximum aggregate size 28 mm.

.5 For cast-in-place manhole bases achieve reduced permeability in the long term.

.4 Concrete supplier's certification required.

.5 Provide quality management plan to ensure verification of concrete quality to specified performance.

Part 3 Execution

3.1 PREPARATION

.1 Provide Departmental Representative 24 hours notice before each concrete pour.

.2 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.

.3 Protect previous Work from staining.

.4 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/APPLICATION

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

.2 Sleeves and inserts:

.1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.

.2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

3.3 FINISHES

.1 Formed surfaces exposed to view: in accordance with CSA A23.1/A23.2, unless specified otherwise.

.2 Pavements, walks, curbs and exposed site concrete:

.1 Screed to plane surfaces and using aluminum, magnesium or wood floats.

.2 Provide round edges and joint spacings using standard tools.

.3 Trowel smooth and provide lightly brushed / broomed non-slip finish, unless specified otherwise.

3.4 CONTROL JOINTS

.1 Form control joints at spacing as indicated below, to CSA A23.1/A23.2 and install joint sealer/filler.

.2 Spacings as follows:

.1 Expansion joints at 9.0m maximum spacing (typical)

.2 Control joints at 3.0m maximum spacing (typical)

.3 Dummy joints at 1.5m maximum spacing (typical)

.4 Isolation joints around all features, such as street light bases, which protrude through the concrete.

.5 Contractor to layout jointing pattern in the field for review and approval by the Departmental Representative before concrete is poured. Contractor is to provide 2 complete working days' notice before review.

3.5 EXPANSION AND ISOLATION JOINTS

.1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

3.6 CURING

.1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.7 SEALING APPLICATION

.1 After curing is complete, apply poly-siloxane resin blend sealer at 4 m^2/L.

3.8 FIELD QUALITY CONTROL

.1 Concrete testing: to CSA A23.1/A23.2 by independent testing laboratory. Test frequency as below:

Activity	Test or Inspection	Required Frequency
Concrete Testing to CSA - A 23.1		
Concrete work -curb and gutter, sidewalks	Plastic Concrete Test (Air Content, Slump & temperature, etc.)	Min. 1 per delivery
	Strength Tests of Cylinders	Every 150 lm or per part thereof. Min one set of 3 cylinders per day per test break interval
Concrete work – subsurface utility works, e.g. manhole bases, thrust blocks, anchor blocks, concrete surround etc.	Plastic Concrete Test (Air Content, Slump & temperature, etc.)	Min. 1 per delivery
	Strength Tests of Cylinders	Daily spot testing, min one set of 3 cylinders per day per test break interval

3.9 CLEANING

.1 Use trigger operated spray nozzles for water hoses.

.2 Designate cleaning area for tools to limit water use and runoff.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 01 50 – General Instructions

.2 Section 32 12 16.02 – Asphalt Paving for Building Sites

.3 Section 32 16 15 – Concrete Walks, Curbs and Gutters

.4 Section 32 92 19.13 – Mechanical Seeding

.5 Section 33 05 13 – Manholes and Catchbasin Structures

.6 Section 33 41 00 – Storm Utility Drainage Piping

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C88, Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

.2 ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregate.

.3 ASTM C117, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.

.4 ASTM D1557, Specification for Test Methods for Aggregate Mixtures using 10 lb (4.54 kg) Rammer and 18 inch (457 mm) Drop.

.5 ASTM D698, Standard Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures using 2.49 kg Rammer and 304.8 mm Drop.

.6 ASTM D6938: Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods.

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction.

3. The Contractor is to examine and comply with:
   1. Golder Associates; Geotechnical Investigation; Perimeter Road Improvements Mission Institution Mission, BC (Golder Report Number: 1114470264-020-R-Rev0 7000); October 31, 2013.

In the case of any conflict between the requirements of the specification sections and the project geotechnical assessment document referred to above, comply with the more stringent requirement(s).

1.3 SCOPE OF WORK

.1 General site clearing, grubbing and topsoil stripping.

.2 Civil Engineering road embankment subgrade works exceeding inclusive of:

.1 Excavating, trenching and backfill for utility services and road restoration.

.2 General site grading

.3 Topsoil restoration

.4 Subgrade and filling below paved areas

1.4 REGULATIONS

.1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

.2 Do not begin backfilling or filling operations until material has been approved for use by the Departmental Representative.

.3 Before commencing work, conduct, with the Departmental Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

1.5 TESTS AND INSPECTIONS

.1 The contractor shall retain, at his own cost, the services of an independent and certified testing agency to undertake soil and granular material tests at the following minimum frequencies / intervals:

Activity	Test or Inspection	Required Frequency
General		
All imported soils, granular materials and aggregates supplied to site, and native materials utilized in lieu	Sieve analysis to ASTM C136	Min. 1 per type aggregate (agg.); 1 prior to commencing work and 1 per every 2,000 tons. Additional sample if materials source or appearance changes
	Proctor to ASTM D1557	Min. 1 per type agg; 1 prior to commencing work and 1 per every 2,000 tons. Additional sample if materials source or appearance changes
Subgrade	Subgrade review prior to fill	All new areas of cut to subgrade elevation; All new areas of over-excavation
Compacted subgrade surface, compacted fill lifts	Proof roll	**Optional –** at the discretion of the Departmental Representative (Geotechnical)
General Fill – Roads	Nuclear density to ASTM D6938	1 every 30 linear meter (lm), per vehicle lane; every lift.
General Fill – Site Grading	Nuclear density to ASTM D6938	1 every 200 square meters (sqm); every lift.
Excavating trenching and backfilling		
Trench Subgrade	Trench Subgrade review prior to backfill	All new areas of cut to subgrade elevation; All new areas of over-excavation
Compacted granular pipe bedding and / or surround	Nuclear density to ASTM D6938	1 every 30 lm, or part thereof (minimum of 2 per pipe length).
Restoration and / or utility pipe trench backfill compaction	Nuclear density to ASTM D6938	Trenches - 1 every 30 linear meter (minimum of 2 per trench), every 500 mm vertical interval Manholes and catchbasins – 2 tests every 1.0m vertical interval
Granular Sub-Base and Base		
Compacted subbase granular – below road pavements	Nuclear density to ASTM D6938	Min. 1 per 100 sq m, or per 30 linear meter (lm) per vehicle lane.
Compacted base granular – below road pavements	Nuclear density to ASTM D6938	Min. 1 per 100 sq m; or per 30 linear meter (lm) per vehicle lane.
	Proof Rolling, prior to paving	All granular base below proposed pavements. **Optional -** at the discretion of the Departmental Representative (Geotechnical)

Activity	Test or Inspection	Required Frequency
Compacted base granular – mulch to curb and gutter;	Nuclear density to ASTM D6938	Every 30 lm. Minimum of 2 tests.
Compacted base granular – below sidewalks/ walkways	Nuclear density to ASTM D6938	Every 30 lm. Minimum of 2 tests. Additional 2 tests per concrete staircase (where applicable).

2. The Contractor shall cooperate with the Departmental Representative in the selection of test samples. Copies of the test results shall be forwarded promptly to Departmental Representative.

3. The Contractor is responsible for ensuring all materials meet specifications. Where initial tests fail and subsequent testing is deemed necessary by the Departmental Representative, the cost of the subsequent testing will be the responsibility of the Contractor.

4. In addition to sample testing, the Contractor will undertake proof rolling of subgrade, subbase and base granular surfaces in road construction areas as required and in the presence of the Departmental Representative for which a minimum of 2 complete working days' notice shall be provided by the Contractor.

1.6 BURIED SERVICES

.1 Before commencing work verify the location of all buried services on and adjacent to the site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations and elsewhere as shown on drawings or where in conflict with the permanent works. Cap cut-offs.

1.7 PROTECTION

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Departmental Representative's approval.

.4 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.

.5 Protect all active buried services. Assume all services to be active unless:

.1 Stated otherwise in contract documents;

.2 Confirmed otherwise by contractor's own investigations in consultation with Departmental Representative.

.6 Repair at contractor's own cost damage to existing structures or services resulting from the contractor's failure to locate and protect.

.7 Avoid mixing excavated materials. Protect the condition and suitability of native soil and topsoil materials stockpiled for re-use.

Part 2 Products

2.1 MATERIALS

.1 Imported granular material to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM test procedure C-88 or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.

.2 Imported crushed granular material when tested according to ASTM C-136 and ASTM C-117, or latest revised issue, to have a generally uniform gradation, conform to following sieve grading and have one or more fractured faces. Determination of the Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "A", which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.

.3 Approved native material is to be used only as used as trench backfill or subgrade fills below areas absent from existing or proposed paving. Approved native material to be any workable soil obtained within limits of Contract that is free of organic or foreign matter, subject to the fact that native material is not acceptable if it is impracticable to control its water content or compact to specified density.

.4 Below paved areas trench backfill and general fill shall consist of imported 75 mm minus crushed granular sub-base complying with the gradation requirements stated for that material in specification section 32 12 16.02 – Asphalt Paving for Building Sites.

.5 Granular Pipe Bedding and Surround Material is to consist of imported 19mm minus crushed granular base complying with the gradation requirements stated for that material in specification section 32 12 16.02 – Asphalt Paving for Building Sites.

.6 Gradation requirements for materials for pavement construction are as specified in Section 32 12 16.02 – Asphalt Paving for Building Sites.

.7 Biaxial Geogrid to be Tensar BX1200, or equivalent approved.

.8 Geotextile to be woven Nilex 2006, or equivalent approved

Part 3 Execution

3.1 SITE PREPRATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated and / or re-graded.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 CLEARING AND GRUBBING

.1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas to be excavated, covered with new construction or re-graded.

.2 Remove stumps and tree roots entirely within the footprint of proposed construction and to not less than 200 mm below finished grade elsewhere.

.3 Dispose of cleared and grubbed material off site daily to disposal areas acceptable to authority having jurisdiction.

3.3 EXCAVATION

.1 Topsoil stripping

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Strip topsoil over areas to be excavated, areas to be covered by new construction, areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.

.3 Topsoil to be stored for re-use in stockpiles not exceeding 1.5m high in location designated by the Departmental Representative.

.4 Should insufficient quantity of native topsoil be available for restoring landscaped areas, due to inappropriate handling or storage of topsoil by contractor, the contractor shall import the required balance at his own cost, ensuring imported material is equal or better than native material.

.5 Avoid mixing topsoil with subsoil.

.2 Excavate as required to carry out work, in all materials met. Notify the Departmental Representative when excavations are complete and obtain Departmental Representative's approval of subgrade. If subgrade competency is unsatisfactory, overexcavation and backfilling with approved compacted granular fills will be authorized in writing and paid for as additional work, subject to Contract Method, Measurement & Payment provisions stated in specification section 01 01 50 – General Instructions.

.3 Temporary excavations for service trenches and building areas deeper than 1.2m requiring worker entry should be sloped/shored in accordance with Workers' Compensation Board regulations, or as directed on site by a qualified professional engineer. Flatter cut slope inclinations may be required if heavy groundwater seepage is encountered or if the temporary excavations will be open during periods of high precipitation.

.4 Dewatering may be required, especially if the excavation is carried out during wet weather. The contractor should protect open excavations against flooding and damage from surface runoff. Select dewatering methods based on site conditions and construction techniques, disposing of water in accordance with Environmental procedures via flocculation tanks, settling basins or other treatment facilities to remove suspended solids or other contaminants before discharging to storm sewers. Avoid discharge to permanent existing or proposed soakaways without written approval of the Departmental Representative.

.5 Excavate trenches to provide uniform continuous bearing and support for 100 mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below an elevation 300 mm above pipe not to exceed diameter of pipe plus 600 mm.

.6 Excavate for slabs and paving to subgrade levels. In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

.7 For trench excavation, unless otherwise authorized by the Departmental Representative in writing, do not excavate more than 30m of trench in advance of installation operations and do not leave open more than 15m at the end of the day's operation.

.8 Keep excavated and stockpiled materials a safe distance (of 2 meters or greater) away from edge of trench. Restrict vehicle operations directly adjacent to open trenches.

.9 Avoid mixing different excavated subsoils.

3.4 BACKFILLING / FILLING

.1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by the Departmental Representative.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction: place backfill / fill in uniform lifts not exceeding 150mm and compact to following Modified Proctor densities in compliance with ASTM D1557. (All densities in compliance with ASTM D1557).

.1 Below boulevards, easements and landscaped areas to minimum 90%

.2 Below and within 1:1 sloping zone of influence of ground-bearing structures, roads, driveways, shoulders, re-shaped ditches, parking areas, paved areas and sidewalks to minimum 95%.

.3 Use caution in pipe zone to ensure no damage to pipe.

.5 Under areas to be top-soiled: use compliant native material up to bottom of topsoil.

.6 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.

.7 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.

.8 During backfilling / filling and compaction, compact each layer before placing succeeding layer.

.9 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing concrete.

.3 Place layers simultaneously on both / all sides of installed work to equalize loading.

3.5 CONTAMINATED MATERIALS

.1 If contaminated materials are detected during excavation operations, immediately notify the Departmental Representative. Any contaminated materials to be disposed of using methods approved by the Departmental Representative.

3.6 GRADING

.1 Following clearing and topsoil stripping excavate to rough grade any areas requiring cut.

.2 Proof roll exposed sub-grade. Excavate soft spots encountered and backfill with permitted materials in maximum 150mm lifts with compaction to specified density.

.3 Before placing fill in areas requiring fill, scarify surface to depth of 150mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.4 In areas requiring fill, raise elevations in permitted materials in maximum 150mm lifts with compaction to specified density.

.5 Employ the preceding operations to achieve rough grading to design elevations allowing for depth of pavement structure, topsoil or other surface treatment as indicated. Grade slopes to be consistent and smooth between finished spot elevations shown on drawings. Tolerance on sub-grade elevations is within 30mm of design elevations but not uniformly high or low.

.6 Slope rough grade away from building at 2% minimum (unless indicated otherwise).

.7 Do not disturb soil within branch spread of trees and shrubs to remain.

3.7 RESTORATION – TOPSOILED AREAS

.1 Prepare subgrade as detailed above and verify that all grades are correct.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75mm above surface. Dispose of removed material to appropriately licensed off-site disposal area.

.4 Coarse cultivate entire area which is to receive topsoil to a minimum depth of 150mm immediately before placing topsoil. Cross cultivate areas where equipment used for hauling and spreading has compacted soil.

.5 When sub-grade accepted by Departmental Representative, commence placing topsoil.

.6 Place topsoil over prepared subgrade and allow to settle or compact by light rolling such that it is firm against deep footprints. Do not compact topsoil more than is necessary to meet this requirement.

.7 Ensure topsoil is moist (25% to 75% of capacity) but not wet when placed, and do not handle if frozen or so wet that its structure will be altered.

.8 Manually spread topsoil around trees, shrubs and obstacles.

.9 Fine grade topsoil after placing to specified elevations and contours. Re-grade rough spots and low areas to ensure positive surface drainage.

.10 Finish surface smooth, uniform, firm against deep footprinting with a fine loose surface texture. Mechanically seed restored and repaired topsoiled areas in accordance with Section 32 92 19.13 – Mechanical Seeding.

3.8 RESTORATION - GENERAL

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

.2 Reinstate pavement, sidewalks and grass-block areas in layers, materials, densities and to lines and elevations which existed before excavation, in all cases providing smooth transition to adjacent paved areas.

.3 Clean all affected surfaces.

.4 Scarify and loosen topsoil in areas used for storage, haulage, machinery and the like.

3.9 SHORTAGE AND SURPLUS

.1 Supply all necessary fill to meet backfilling and grading requirements.

.2 Dispose of surplus material off site.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 01 50 – General Instructions.

.2 Section 32 12 16.02 – Asphalt Paving for Building Sites.

1.2 References

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM C117 04, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136 06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D2419 09, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.2 Canadian General Standards Board (CGSB)

.1 CAN/ CGSB 8.1 88, Sieves Testing, Woven Wire, Inch Series.

.2 CAN/ CGSB 16.2 M89, Emulsified Asphalts, Anionic Type, for Road Purposes.

.3 CAN/ CGSB 16.4 M89, Emulsified Asphalts, Cationic Type, for Road Purposes.

1.3 Samples

.1 Submit samples in accordance with Section 01 01 50 – General Instructions.

.2 Submit to the Departmental Representative the following samples of materials proposed for use at least 2 weeks prior to beginning Work.

.1 One 4 L container of asphalt material. Submit emulsions in plastic container.

.2 One 20 kg sample of each aggregate gradation.

.3 Provide access for the Departmental Representative to sample materials actually incorporated into Work as required.

1.4 Certificates

.1 Submit manufacturer's test data and certification that following materials meet requirements of this Section to the Departmental Representative at least 2 weeks prior to beginning Work:

.1 Aggregates.

1.5 Waste Management And Disposal

.1 Separate and recycle waste materials.

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

recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on site bins for recycling in accordance with Waste Reduction Workplan and the Material Source Separation Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Divert unused aggregate materials from landfill to a facility for reuse as approved by the Departmental Representative.

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 Divert unused asphalt from landfill to facility capable of recycling materials.

.8 Dispose of unused sealing at official hazardous material collections site or recycling facility approved by the Departmental Representative.

.9 Do not dispose of unused sealing mix into the sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 Materials

.1 Emulsified asphalt: to CAN/CGSB 16.2, grade SS 1 and / or CAN/ CGSB 16.4, grade CRS 1.

.2 Aggregate for crack filling: material to following requirements:

.1 Screened sand or screenings.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB 8.1.

.3 Table:

Sieve Designation	% Passing Sand-asphalt slurry using emulsion
12.5 mm	100
9.5 mm	80-100
4.75 mm	50-95
2.36 mm	30-80
0.600 mm	10-50
0.300 mm	0-25
0.075 mm	0-6

.4 Sand equivalent: to ASTM D2419, not less than 45%.

.5 Mixing water: free from foreign matter.

2.2 Equipment

.1 Pressure applicator capable of applying slurry at 100 kPa from a one nozzle arrangement.

.2 Hand tools.

.3 Small diameter diamond bladed pavement saws or mechanical rotary routers specifically designed for following random irregular cracks without tearing, chipping or spalling edge and capable of producing clean, vertical side walls. Open "V" type grooves not permitted.

2.3 Mixes

.1 Prepare sand asphalt slurry or mix with following proportions:

.1 50 kg of aggregates.

.2 16L of asphalt material.

.3 Water to produce uniform mix of consistency to achieve full penetration into cracks.

.2 Hot mix asphalt concrete: in accordance with Section 32 12 16.02 - Asphalt Paving for Building Sites.

PART 3 - EXECUTION

3.1 Preparation

.1 Clean cracks in areas indicated on the contract drawings.

.2 Remove existing sealer and loose materials

.1 From spalled edges and pavement surface.

.2 To minimum depth of 19 mm.

.3 Saw or Rout designated cracks to minimum width of 16 mm using rotary routers or pavement saws approved by the Departmental Representative.

.4 Saw or Rout designated cracks to depth between 19 mm and 25 mm.

.5 Clean loose material from cracks with oil free compressed air applied at pressure not less than 600 kPa.

.6 Dispose of material removed from cracks at a landfill facility licensed for the material.

3.2 Crack Filling

.1 Ensure cracks are clean and dry immediately before filling.

.2 Fill cracks designated and approved by the Departmental Representative.

.3 Do not use frozen aggregate.

.4 Fill cracks when air temperature is above 10^{o}C and rising, when daily low temperature does not fall below 5^{o}C, and when no rain is forecast.

.5 Fill and tamp cracks with sufficient applications to ensure cured fill material is level with pavement surface.

.6 Cracks wider than 50 mm may be filled with hot mix asphalt concrete and tamped, immediately prior to placement of asphalt concrete overlay, where approved by the Departmental Representative.

.7 Remove and dispose of excess filling material as directed by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for installation and/or restoration for asphalt concrete paved areas.

1.2 RELATED SECTIONS

.1 Section 31 00 99 – Earthwork for Minor Works.
.2 Section 32 01 11.02 – Pavement Crack Cleaning and Filling

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
  .1 ASTM C88-99a, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
  .2 ASTM C117-95, Standard Test Method for Material Finer Than 0.075 (No. 200) mm Sieve in Mineral Aggregates by Washing.
  .3 ASTM C123-98, Standard Test Method for Lightweight Particles in Aggregate.
  .4 ASTM C127-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
  .5 ASTM C128-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
  .6 ASTM C131-01, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  .7 ASTM C136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  .8 ASTM D698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).
  .9 ASTM D995-95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
  .10 ASTM D1557-00, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).
  .11 ASTM D1559-89, Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus, was withdrawn in 1998 with no replacement.
  .12 ASTM D2419-02, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
  .13 ASTM D3203-94(2000), Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
  .14 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
  .15 ASTM D6938: Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods.
.2 Asphalt Institute (AI)
  .1 AI MS-2-1993 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
.3 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.
  .2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
  .3 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
  .4 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
  .5 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.

3. The Contractor is to examine and comply with:
   1. Golder Associates; Geotechnical Investigation; Perimeter Road Improvements Mission Institution Mission, BC (Golder Report Number: 1114470264=020-R-Rev0 7000); October 31, 2013.

   In the case of any conflict between the requirements of the specification sections and the project geotechnical assessment document referred to above, comply with the more stringent requirement(s).

1.4 SUBMITTALS

.1 Submit asphaltic concrete mix design and trial mix test results to Departmental Representative for review, at least one week before commencing work.

.2 Materials to be tested by an accredited and independent testing laboratory including:

Activity	Test or Inspection	Required Frequency
Hot-Mix Asphalt Concrete Paving		
Asphalt Pavement	HMA Sample Marshall Test	1 test per asphalt type of mix, per 500 tonnes ; min 1 per day
Asphalt Pavement - roads	Coring density and thickness test	Every 100 square meters in areas of asphalt restoration to existing surface. Every 75 linear meters per lane on overlay and raised pavement areas;

.3 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work, certifying that asphalt cement meets the requirements of this section.

.4 Inform Departmental Representative of proposed source of aggregates and provide access for sampling, if required, at least 4 weeks prior to commencing work.

.5 Submit testing and compliance records for granular base and sub-base materials as identified in Section 31 00 99 - Earthwork for Minor Works, the relevant parts of which are repeated below for convenience.

Activity	Test or Inspection	Required Frequency
Granular Sub-Base and Base		
Compacted subbase granular – below road pavements	Nuclear density to ASTM D6938	Min. 1 per 100 sq m, or per 30 linear meter (lm) per vehicle lane.
Compacted base granular – below road pavements	Nuclear density to ASTM D6938	Min. 1 per 100 sq m; or per 30 linear meter (lm) per vehicle lane.
	Proof Rolling, prior to paving	All granular base below proposed pavements. **Optional -** at the discretion of the Departmental Representative (Geotechnical)
Compacted base granular – mulch to curb and gutter;	Nuclear density to ASTM D6938	Every 30 lm. Minimum of 2 tests.
Compacted base granular – below sidewalks/ walkways	Nuclear density to ASTM D6938	Every 30 lm. Minimum of 2 tests. Additional 2 tests per concrete staircase (where applicable).

Part 2 Products

2.1 MATERIALS

.1 Crushed granular base and crushed granular sub-base material meeting the following requirements:

.1 Well graded crushed or screened stone, gravel or sand.

.2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117. Table:

Sieve Designation	Granular Base (% passing)	Granular Sub-Base (% passing)
75 mm	-	100
50 mm	-	-
38 mm	-	60-100
25 mm	-	-
19 mm	100	35-80
12.5 mm	75-100	-
9.5 mm	60-90	26-60
4.75 mm	40-70	20-40
2.36 mm	27-55	15-30
1.18mm	16-42	10-20
0.600 mm	8-30	5-15
0.300 mm	5-20	3-10
0.150mm	-	-
0.075 mm	2-8	0-5

.3 Granular base aggregates:

.1 Crushed particles: at least 60 % of particles by mass retained on 4.75 mm sieve to have at least 1 freshly fractured face.

.2 Asphalt concrete aggregates:

.1 Coarse aggregate is aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C117.

.2 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.

.3 Do not use aggregates having known polishing characteristics in mixes for surface courses.

.4 Aggregate: material to following requirements:

.1 Well graded crushed stone or gravel, consisting of hard, durable , angular particles free from clay lumps, cemetation, organic material, frozen material and deleterious materials.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117.

.3 Table:

Sieve Designation	Asphalt Concrete Lower Course (% Passing)	Asphalt Concrete Upper Course (% Passing)
19.0 mm	100	-
12.5mm	84-99	100
9.5 mm	73-88	-
4.75 mm	50-68	55-75

Sieve Designation	Asphalt Concrete Lower Course (% Passing)	Asphalt Concrete Upper Course (% Passing)
2.36 mm	35-55	38-58
1.18 mm	27-46	28-47
0.600 mm	18-36	20-36
0.300 mm	10-26	10-26
0.150 mm	4-17	4-17
0.075 mm	3-8	3-8

.4 Sand equivalent: to ASTM D2419, Minimum 40.

.5 Magnesium Sulphate soundness: to ASTM C88. Max % loss by weight: coarse aggregate 15, fine aggregate 18.

.6 Los Angeles Degradation: to ASTM C131. Max % loss by weight: coarse aggregate upper course 25, coarse aggregate lower course 35.

.7 Absorption: to ASTM C127. Max % by weight: coarse aggregate, 1.75.

.8 Loss by washing: to ASTM C117; Max % passing 0.075mm sieve: Coarse Aggregate 1.5.

.9 Lightweight particles: to ASTM C123. Max % by mass, with less than 1.95. Relative density (formally Specific Gravity): 1.5.

.10 Flat and elongated particles: to ASTM D4791, (with length to thickness ratio greater than 3): Max % by weight: coarse aggregate, 10.

.11 Crushed particles: at least 60 % of particles by mass within each of following sieve designation ranges to have at least 2 freshly fractured faces. Material to be divided into ranges using methods of ASTM C136 and ASTM C117.

Passing		**Retained on**
25 mm	to	12.5 mm
12.5 mm	to	4.75 mm

.12 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

.3 Mineral filler for asphalt concrete:

.1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.

.2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed by Departmental Representative to improve mix properties.

.4 Asphalt cement: to CAN/CGSB-16.3, 80 - 100.

.5 Asphalt prime: to CAN/CGSB-16.1, grade MC-70.

.6 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.

.7 Asphalt tack coat: to CAN/CGSB-16.2, grade SS-1.

2.2 EQUIPMENT

.1 Pavers: mechanical (grade controlled) self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers for parking lots and driveways:

.1 Minimum drum diameter: 750 mm.
.2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.

.4 Haul trucks: of sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
.1 Boxes with tight metal bottoms.
.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.5 Suitable hand tools.

2.3 MIX DESIGN

.1 Mix design to AI MS-2.
.2 Design of mix: by Marshall method to requirements below:
.1 Compaction blows on each face of test specimens: 75.

.2 Mix physical requirements:

Property	**Lower Course**	**Upper Course**
Marshall Stability at 60 degrees C, kN minimum.	6.4	5.5
Flow Value, mm.	2-4	2-4
Air Voids in Mixture, %	3-6	3-5
Voids in Mineral Aggregate, % minimum	14	15
Index of Retained Stability, % minimum	75	75

.3 Measure physical requirements as follows:
.1 Marshall load and flow value: to ASTM D1559.
.2 Compute void properties on basis of bulk specific gravity of aggregate to ASTM C127 and ASTM C128. Make allowance for volume of asphalt absorbed into pores of aggregate.
.3 Air voids: to ASTM D3203.
.4 Voids in mineral aggregate: to AI MS-2, chapter 4.
.5 Index of Retained Stability: measure in accordance with Marshall Immersion Test for Bitumen, ASTM D 1559.

.4 Do not change job-mix without prior approval of Departmental Representative. When change in material source proposed, new job-mix formula to be approved by Departmental Representative.

Part 3 Execution

3.1 SUBGRADE PREPARATION AND INSPECTION

.1 Verify grades of subgrade and items set in paving area for conformity with elevations and sections before placing granular base and sub-base material.
.2 Obtain approval of subgrade by Geotechnical Departmental Representative before placing granular sub-base and base.

3.2 GRANULAR SUB-BASE AND GRANULAR BASE

.1 Place granular base and sub-base material on clean unfrozen surface, free from snow and ice.
.2 Place granular base and sub-base to compacted thicknesses as indicated. Do not place frozen material.
.3 Place in layers not exceeding 150 mm compacted thickness. Compact to density not less than 95 % Modified Proctor Density in accordance with ASTM D1557.
.4 Finished base surface to be within 10 mm of specified grade, but not uniformly high or low.

3.3 ASPHALT PRIME

.1 Cutback asphalt:
  .1 Heat asphalt prime for pumping and spraying in accordance with CAN/CGSB-16.1.
  .2 Apply cutback asphalt prime to granular base, at rate not exceeding 2 L/m^2.
  .3 Apply on damp surface, unless otherwise directed by Departmental Representative.
.2 Emulsified asphalt:
  .1 Dilute asphalt emulsion with clean water at 1:1 ratio for application. Mix thoroughly by pumping or other method approved.
  .2 Apply diluted asphalt emulsion not exceeding 5 L/m^2.
  .3 Apply on damp surface unless otherwise directed.
.3 Do not apply prime when air temperature is less than 5 degrees C or when rain is forecast within 2 hours.
.4 If asphalt prime fails to set within 24 hours, spread sand blotter material in amounts required to absorb excess material. Sweep and remove excess blotter material.

3.4 ASPHALT TACK COAT

.1 Apply asphalt tack coat only on approved clean, dry surfaces.
.2 Dilute asphalt emulsion with water at 1:1 ratio for application. Mix thoroughly by pumping.
.3 Apply tack coat evenly to pavement surface not exceeding 0.7L/m^2, when diluted.
.4 Paint contact surfaces of curbs, edges, headers, gutters, manholes and like structureswith thin uniform coat of asphalt tack coat material.
.5 Do not apply tack coat at air temperature below 5 degrees C or when rain forecast within 2 hours of application.
.6 Apply tack coat only to surfaces that are to be overlayed same day.
.7 Evenly distribute localized excessive deposits of tack coat by brooming.
.8 Where traffic is to be maintained treat no more than one half the width of the surface in one application.
.9 Keep traffic off tacked areas until asphalt tack coat has set.

3.5 PLANT AND MIXING REQUIREMENTS

.1 In accordance with ASTM D995.

3.6 ASPHALT CONCRETE PAVING

.1 Obtain approval of base, tack coated and primed areas before placing asphalt mix.
.2 Place asphalt mix only when base or previous course is dry and air temperature is above 5 degrees C. Place overlay pavement only when air temperature is above 10 degrees C.
.3 Place asphalt concrete in compacted layers not exceeding 50 mm per lift and not less than 35mm per lift.

.4 Minimum 135 degrees C mix temperature required when spreading.
.5 Maximum 160 degrees C mix temperature permitted at any time.
.6 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.
.7 Compact parking lot and driveway asphalt concrete to density not less than 97 % of density obtained with Marshall specimens prepared in accordance with ASTM D1559 from samples of mix being used. Roll until roller marks are eliminated.
.8 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.
.9 Moisten roller wheels with water to prevent pick up of material.
.10 Compact mix with hot tampers or other approved equipment, in areas inaccessible to roller.
.11 Finished surface is to be within 6 mm of design elevations and not uniformly high or low. Surface irregularities are not to exceed 6 mm when checked with a 3m straight edge in any direction. Water ponding on the finished surface is not permitted.
.12 Repair areas showing checking, rippling, segregation or which are otherwise out of compliance with specified criteria.

3.7 JOINTS

.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
.2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
.3 For cold joints, cut back to full depth vertical face and tack face with hot asphalt.
.4 For longitudinal joints, overlap previously laid strip with spreader by 25 to 50 mm.

3.8 PROTECTIVE COATING

.1 Apply 2 coats of protective coating to completed paved areas and asphalt curbs in accordance with manufacturer's instructions.

3.9 PROTECTION

.1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38 degrees C. Do not permit stationary loads on pavement until 24 hours after placement.
.2 Provide access to buildings as required. Arrange paving schedule so as not to interfere with normal use of premises.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00.01 – Cast-in-place Concrete (Short Form)

.2 Section 31 00 99 – Earthworks for Minor Works.

.3 Section 32 12 16.02 – Asphalt for Building Sites.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.

.4 ASTM D698-00ae1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.3-99(March 2004), Kerosene, Amend. No. 1, National Standard of Canada.

.2 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00.01 - Cast-in-Place Concrete (Short Form) with the following criteria specific to this section:

.1 Hand-formed and hand placed concrete:

.1 Slump: 80mm

.2 Air Entrainment: 5 to 8%

.3 Maximum aggregate size: 20mm

.4 Minimum cement content: 335kg/m^3

.5 Minimum 28 day compressive strength: 32 MPa

.2 Extruded concrete:

.1 Slump: 0-25mm

.2 Air Entrainment: 6 to 9%

.3 Maximum aggregate size: 10mm

.4 Fineness modulus: 2.1 to 2.4

.5 Minimum cement content: 335kg/m^3

.6 Minimum 28 day compressive strength: 32 MPa

.2 Joint filler in accordance with Section 03 30 00.01 - Cast-in-Place Concrete (Short Form).

.3 Crushed granular base: material to item 2.1.1 of Section 32 12 16.02 – Asphalt for Building Sites.

.4 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

.5 Fill material: to item 2.1.5 of Section 31 00 99 – Earthwork for Minor Works.

.6 Boiled linseed oil: to ASTM D260.

.7 Kerosene: to CAN/CGSB-3.3.

Part 3 Execution

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 00 99 – Earthwork for Minor Works.

.2 In preparing grade allow for width of gravel base including shoulders as detailed, beyond edges of concrete.

.3 Place fill in maximum 150 mm lifts and compact to at least 95% Modified Proctor Density to ASTM D1557.

3.2 GRANULAR BASE

.1 Obtain Geotechnical Departmental Representative's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 150 mm layers to at least 95% Modified Proctor Density to ASTM D1557, and to within 10mm of specified grade, but not uniformly high or low.

3.3 FORMWORK

.1 Ensure steel forms of approved design and free from twists and warp.

.2 Ensure wood forms of select dressed lumber, straight and free from defects and thoroughly cleaned.

.3 Use flexible forms for all curves less than 60m radius.

.4 After obtaining Departmental Representative's approval of compacted base, set forms to line and grade as shown on Contract Drawings. Free from waves or irregularities in line or grade.

.5 Set special isolation forms as required around catchbasin, manholes, pole bases or other objects as shown or as required for implementing other items of the Works.

.6 Forms to be to shape, lines and full dimensions or the work being formed.

.7 Adequately brace forms to maintain specified tolerances after concrete is placed.

.8 Treat forms lightly with approved release agent and remove surplus agent.

3.4 CONCRETE PLACEMENT

.1 Obtain Geotechnical Departmental Representative's approval of granular base prior to placing concrete.

.2 In conjunction with execution of formwork and with reference to sidewalk joint spacing dimensions described in Section 03 30 00.01 – Cast-in-place Concrete (Short Form), layout proposed expansion, control and dummy joints and agree / adjust same to the approval of the Departmental Representative.

.3 Do concrete work in accordance with Section 03 30 00.01 – Cast-in-Place Concrete (Short Form).

.4 Do not place during rain or on ponded water or frozen base.

.5 Do not place concrete when air temperature appears likely to fall below 5 degrees C within 24 hours unless specified precautions are taken and approved by Departmental Representative.

.6 Schedule concrete placement to ensure sufficient daylight hours available to permit edging and finishing or provide adequate illumination.

.7 Moisten granular base immediately prior to placing concrete.

.8 Place concrete within 1.5 hours of batching time.

.9 Place concrete in forms, ensuring no segregation of aggregate and consolidate with approved mechanical vibrator or power screed.

.10 Place concrete in continuous operation until entire panel or section completed. Do not place fresh concrete on concrete which has achieved partial set.

.11 Incorporate all castings into concrete at time of placement.

.12 Discontinue placement at expansion, construction or isolation joints only.

.13 Remove face forms as soon as practical to permit face finishing. Do not leave face forms in place overnight.

3.5 EXTRUDED SECTIONS

.1 Extruding machine to be fitted with approved template consistent with sections shown on Standard Details.

.2 Extruded sections to be true to line, grade and cross-section.

.3 Finished appearance, quality and workmanship to comply with Contract Drawings, this specification and Standard Details.

.4 Where finished product does not conform to specifications, remove defective product and replace.

3.6 TOLERANCES

.1 Maximum horizontal or vertical deviation = 6mm. Maximum irregularity from finished horizontal or vertical alignment to be 6mm in 3 m.

3.7 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals not exceeding those indicated on contract details.

.2 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

.3 Extend through full depth of concrete.

.4 Fill with 13mm approved expansion joint material.

.5 Bond break compound may be used in lieu of expansion joint between sidewalk and back of abutting curb and gutter or where applicable between sidewalk and back of abutting utility strip or sidewalk infill.

3.8 CONTROL JOINTS

.1 In sidewalks, infill, curbs or curb and gutter construct control joints at maximum 3m intervals. Where sidewalks, infill, curbs or curb and gutter are adjacent, make joints in each coincide.

.2 Cut such that uncut depth does not exceed 75mm.

.3 Use proper tool to make cut while concrete is still green or sawcut after concrete has hardened.

3.9 ISOLATION JOINTS

.1 Form isolation joints around all poles, hydrants, manholes, and all structures or fixed objects located within concrete section by using specified joint filling material.

3.10 FINISHING

.1 Finish surface of concrete sidewalks and utility strips to smooth surface with magnesium or wood float and then immediately brush or broom to provide uniform non-skid surface complete with regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.2 Broom or brush crossways or as otherwise directed if / as necessary to match adjacent finish.

.3 Grooves or scoring (dummy joints) used for aesthetic purposes to be marked with proper tools and set 15mm deep.

.4 Round edges of panels between each expansion, control and/or dummy joint with steel edging tool to a width of between 30 and 50mm (but not varying) around perimeter of each panel.

.5 Ensure surface of hand-formed curb and gutter is smooth magnesium or wood float finish. Ensure extruded curb and gutter is smooth finished and hand floated as required to correct irregularities.

.6 Under no circumstances is concrete to be overworked by trowelling, dusted with dry cement or finished with a mortar coat.

3.11 PROTECTION

.1 Protect freshly finished concrete from dust, rain or frost by using appropriate coverings, kept clear of finished surface.

.2 Protect finished concrete from equipment, vehicles, pedestrians and all other potential damage.

3.12 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 7 days after placing, or sealing moisture in by curing compound to all exposed concrete surfaces at rate recommended by manufacturer.

.2 When temperature is below 5 degrees C, maintain all concrete at temperature not less than 10 degrees C for at least 72 hours and protect from freezing for at least another 72 hours or such time as required to ensure proper curing of concrete. Admixtures are not to be used for prevention of freezing.

3.13 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material per Section 31 00 99 – Earthwork for Minor Works.

.3 Compact and shape to required contours or and / or spot elevations as indicated.

3.14 LINSEED OIL TREATMENT

.1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete is clean and dry.

.2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.

.3 Apply treatment when air temperature above 10 degrees C.

.4 Apply first coat at 135 mL/m^2.

.5 Apply second coat at 90 mL/m^2 when first coat has dried.

3.15 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 12 16.02 – Asphalt Paving for Building Sites.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-1.5-99, Low Flash Petroleum Spirits Thinner.
  .2 CAN/CGSB 1.74-01, Alkyde Traffic Paint.
.2 Green Seal Environmental Standards (GS)
  .1 GS-11-2008, 2nd Edition, Paints and Coatings.
.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).
.4 The Master Painters Institute (MPI)
  .1 Architectural Painting Specification Manual - current edition.
.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  .1 SCAQMD Rule 1113-A2007, Architectural Coatings.

1.3 SUBMITTALS

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

Part 2 Products

2.1 MATERIALS

.1 Paint:
  .1 To MPI -EXT 2.1B, Alkyd zone/traffic marking.
  .2 Paints: in accordance with MPI recommendation for surface conditions.
    .1 Paints: maximum VOC limit 100 g/L to SCAQMD Rule 1113 to GS-11.
  .3 Colour: to MPI listed, white.
.2 Thinner: to MPI listed manufacturer.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.
  .1 Visually inspect substrate in presence of Departmental Representative.
.2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
.3 Proceed with Work only after unacceptable conditions have been rectified.

3.2 EQUIPMENT REQUIREMENTS

.1 Paint applicator: approved pressure type mobile with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated.

3.3 APPLICATION

.1 Pavement markings: Contractor to lay out pavement markings and obtain approval.
.2 Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 10 degrees C, wind speed is less than 60 km/h and no rain is forecast within next 4 hours.
.3 Apply traffic paint evenly at rate of 3 m^2/L.
.4 Do not thin paint unless approved.
.5 Symbols and letters to dimensions indicated.
.6 Paint lines: of uniform colour and density with sharp edges.
.7 Thoroughly clean distributor tank before refilling with paint of different colour.

3.4 TOLERANCE

.1 Paint markings: within plus or minus 10 mm of original / indicated dimensions.
.2 Remove incorrect markings to satisfaction of the Departmental Representative.

3.5 PROTECTION OF COMPLETED WORK

.1 Protect pavement markings until dry.

END OF SECTION

Part 1 General

1.1 SCOPE OF APPLICATION

.1 Existing and proposed unpaved landscaped areas (excluding flower beds and planted borders) that are subjected to utility trenching, re-grading, disturbance or degradation due to the Contractor's construction and activities:

.1 to be mechanically seeded as described in this section after receiving topsoil restoration in accordance with Section 31 00 99 – Earthwork for Minor Works.

1.2 RELATED SECTIONS

.1 Section 01 01 50 – General Instructions

.2 Section 31 00 99 – Earthwork for Minor Works

1.3 SUBMITTALS

.1 Product Data:

.1 Submit product data in accordance with Section 01 01 50 – General Instructions.

.2 Provide product data for:

.1 Seed mixture complete with supplier's recommended:

.1 Mechanical placement rates

.2 Fertilization products, rates and frequency.

.2 Fertilizer compatible with seed mixture suppliers recommendations.

1.4 QUALITY ASSURANCE

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

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

1.5 SCHEDULING

.1 Schedule seeding to coincide with preparation of soil surface.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused fertilizer from landfill to official licensed hazardous material collections site.

.2 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 GRASS SEED

.1 Canada "Certified" “Canada Pedigreed grade” seed, "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.2 In packages individually labelled in accordance with "Seeds Regulations" and indicating name of supplier.

2.2 WATER

.1 Free of impurities that would inhibit germination and growth.

2.3 FERTILIZER

.1 To Canada "Fertilizers Act" and "Fertilizers Regulations".

.2 Complete synthetic fertilizer with guaranteed minimum analysis as specified.

Part 3 Execution

3.1 QUALITY OF WORK

.1 Do not perform work under adverse field conditions such as excessive wind speeds, frozen ground or ground covered with snow, ice or standing water.

.2 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site to a licensed contaminated soils disposal site.

3.2 SEED BED PREPARATION

.1 Verify that grades are correct. If discrepancies occur, notify and do not commence work until instructed by Departmental Representative.

.2 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated to tolerance of plus or minus 15mm, surface draining naturally.

.3 Cultivate fine grade to 25mm depth immediately prior to seeding.

3.3 SEED PLACEMENT

.1 For mechanical seeding:

.1 Use "Brillion" type mechanical landscape seeder which accurately places seed at specified depth and rate and rolls in single operation.

.2 For manual seeding only outside of the areas accessible to mechanical seeder:

.1 Use "Cyclone" type manually operated seeder.

.2 Use manually operated, water ballast, landscaping type, smooth steel drum roller.

.3 On cultivated surfaces, sow seed uniformly at rates recommended by supplier provided at 1.2.1.2 above.

.4 Blend applications 300mm into adjacent grass areas and previous applications to form uniform surfaces.

.5 Sow half of required amount of seed in one direction and remainder at right angles as applicable.

.6 Incorporate seed by light raking in cross directions.

.7 Consolidate mechanically seeded areas by rolling area if soil conditions warrant immediately after seeding.

.8 Protect seeded areas from trespass until plants are established.

3.4 FERTILIZING PROGRAM

.1 Fertilize during establishment period to as per product data / supplier recommendations provided at 1.2.1.2 above:

3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of seed application until acceptance by Departmental Representative:

.1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

.2 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.3 Cut grass to 50mm whenever it reaches height of 100mm. Remove clippings which will smother grass.

.4 Fertilize seeded areas after first cutting or in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in.

.5 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

3.6 FINAL ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Areas are uniformly established and turf is free of rutted, eroded, bare or dead spots and free of weeds.

.2 Areas have been cut at least twice.

.3 Areas have been fertilized.

.4 Any establishment practices, including scheduled or recommended fertilizations, not yet accomplished to be recorded in the Operations and Maintenance Manual.

.2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

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 SECTIONS

.1	Cast-in-place concrete (short form)	Section 03 30 00.01
.2	Earthwork for Minor Works	Section 31 00 99
.3	Strom Utility Drainage Piping	Section 33 41 00

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM C478M, Specification for Precast Reinforced Concrete Manhole Sections.
- .2 ASTM A48, Specification for Gray Iron Castings.
- .3 ASTM C-497, Test Methods for Concrete Pipe, Manhole Sections, or Tile
- .4 ASTM-D-4101, Propylene Plastic Injection and Extrusion Materials.
- .5 ASTM A615M, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- .6 ASTM C443M, Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- .7 ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
- .8 ASTM A185, Reinforcing steel welded mesh fabric

.2 Canadian Standards Association (CSA International)

- .1 CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .2 CSA-S157, Strength Design in Aluminum.
- .3 CSA A82.56, Aggregate for Masonry Mortar.
- .4 CAN/CSA-A8, Masonry Cement
- .5 CAN3-A165 Series, CSA Standards on Concrete Masonry Units.
- .6 CAN/CSA-A3001 - Cementitious Materials for Use in Concrete.Precast manhole units

1.3 MATERIALS

.1 Precast manhole and catch basin units to: ASTM C478M complete with ladder rungs.

.2 Manhole lids: to be precast reinforced concrete designed to withstand H20 loading.

.3 Cast iron frame and cover, cast with the word “Storm” or “Sanitary” as applicable:

- .1 Frame and cover must conform to ASTM A48 be designed to withstand H20 loading.
- .2 Frame and cover must bear manufacturer identification on castings.

.4 Ladder rungs to be:

- .1 To conform to ASTM C-497, C-478 load test.
- .2 20 mm cold rolled steel, hot dipped after bending to CSA G164, welded to reinforcing bars and cast with manhole sections or epoxy grouted into manhole walls.

.3 20 mm aluminum allow #6351-T6 (CSA-S157 and NBC 1977), complete with polyethylene anchor precast or drilled holes in manhole sections.

.4 Polypropylene encased steel ladder rungs; polypropylene ASTM-D-4101 steel core to be ½ inch dia grade 60 as per ASTM A615M.

.5 Distance from top of manhole cover to top rung to be maximum 500 mm where no handhold provided. Maximum distance may be extended to 660 mm wher handhold provided.

.6 In compliance with all requirements of Workers' Compensation Board.

.5 Precast catch basin sections: to ASTM C478M.

.6 Catchbasin leads to be minimum 150 mm diameter and of PVC DR35.

.7 Catchbasin lids: to be precast reinforced concrete designed to withstand H20 loading.

.8 Cast iron catchbasin and lawn drain frame and grate:

.1 Frame and grate must conform to ASTM A48 and be designed to withstand H20 loading.

.2 Frame and grate must bear manufacturers identification on casting.

.9 Joints: made watertight using cement mortar or rubber gaskets to ASTM C443.

.10 Mortar:

.1 Aggregate: to CSA A82.56

.2 Cement: to CAN/CSA-A8.

.11 Adjusting rings: to ASTM C478.

.12 Concrete Brick: to CAN3-A165 Series.

.13 Drop manhole pipe: same as sewer pipe.

.14 Galvanized iron sheet: approximately 2 mm thick.

.15 Concrete for cast-in-place bases and benching to be minimum 20 MPa with constituent materials conforming to CAN/CSA-A5, A23.5 and A23.1.

.16 Precast concrete lawn drain units manufactured to withstand AASHTO H-20 loading, wet-cast from concrete with compressive strength of 4000 PSI at 28 days. Reinforcing mesh to ASTM A185. Reinforcing steel deformed bars to ASTM A615.

Part 2 Execution

2.1 MANUFACTURER'S INSTRUCTIONS

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

2.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 00 99 Earthwork for Minor Works and as indicated.

.2 Obtain approval of the Departmental Representative for manholes or catch basins.

2.3 CONCRETE WORK

.1 Do cast-in-place concrete work including surface tolerances, finishing and field quality control, in accordance with CAN/CSA-A23.1.

.2 Position metal inserts in accordance with dimensions and details as indicated.

2.4 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Place minimum 100 mm of 25 mm bedding gravel compacted to minimum 95% Modified Proctor density in compliance with ASTM D1557.

.3 Set all inlet and outlet pipes to specified alignments and elevations.

.4 Connect concrete pipe into manhole using spigot or bell precast into manhole wall or, alternatively, grout pipe into pre-formed rough core in manhole wall using fast-setting grout.

.5 Connect PVC pipe into manhole using “manhole adapter ring” or approved equal.

.6 Ensure excavation free of water and approved by geotechnical engineer prior to placing concrete.

.7 Set remaining precast riser sections plumb with joints consisting of cement mortar or gasket to ASTM C443.

.8 Brace capped inlets or stubs to withstand testing head.

.9 Set frames by firmly embedding in mortar on a minimum of 1, maximum of 3 courses of bricks or precast concrete riser rings, or cast-in-place form system with due regard to maximum distance to first step.

.10 Plug lifting holes in pipe.

.11 Ensure frames conform to design contour of pavement or existing surface.

.12 Clean units of debris and foreign materials.

.1 Remove fins and sharp projections.

.2 Prevent debris, silt and contaminants from entering system.

2.5 ADJUSTING TOPS OF EXISTING UNITS

.1 Remove existing gratings, frames and store for re-use at locations designated by the Departmental Representative.

.2 Precast units:

.1 Raise or lower precast units by adding or removing precast sections as required.

.2 When amount of raise is less than 300 mm use standard manhole bricks, precast riser rings or cast-in-place form system.

.3 Re-set gratings and frames to required elevation on not more than 3 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.

.4 Ensure adjustments conform to requirements regarding distance to first step.

2.6 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for storm sewer and culverts.

1.2 RELATED SECTIONS

.1	General Instructions	- Section 01 01 50
.2	Earthwork For Minor Works	- Section 31 00 99
.3	Manholes and Catch Basin Structures	- Section 33 05 13

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM D3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .2 ASTM D2412, Standard Test Method for External Loading Properties of Plastic Pipe by Parallel-Plate Loading.
- .3 ASTM D3212, Specification for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomic Seals.
- .4 ASTM F477, Specification for Elastomeric Seals (Gaskets) for joining Plastic Pipe.
- .5 ASTM D1557, Specification for Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb (4.54 kg) Rammer and 18 inch (475 mm) Drop.

.2 Canadian Standards Association (CSA International)

- .1 CSA B182.2, Large Diameter, Type PSM PVC Sewer Pipe and Fittings.
- .2 CSA B182.11, Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings.

1.4 DEFINITIONS

.1 A pipe section is defined as length of pipe between successive catchbasins and/or manholes/headwalls.

1.5 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.2 Indicate proposed method for installing carrier pipe for undercrossings.

.3 Submit samples in accordance with Section 01 01 50 – General Instructions.

.4 Test bedding, surround and backfill materials as referred to in Section 31 00 99 – Earthwork for Minor Works.

.5 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.6 Ensure certification is marked on pipe.

.7 Submit manufacturers information data sheets and instructions in accordance with Section 01 01 50 – General Instructions.

1.6 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

Part 2 Products

2.1 PLASTIC PIPE

.1 Polyvinyl chloride pipe up to 1200 mm in diameter, DR35 Pipe to have minimum pipe stiffness (F/Y) of 320 kPa at 5.0% deflection, ASTM D2412. Pipe to be manufactured to specifications for pipe size ranges as follows:

100 mm dia. – 375mm dia. To ASTM D3034

Pipes to be certified by Canadian Standards Association to standards for pipe size ranges below.

100 mm dia. – 1200 mm dia. To CSA B182.2

.2 Joints: To conform to ASTM D3212; pipe to include integral bell and spigot ends with stiffened wall section and formed groove for a rubber gasket; elastomeric gaskets to ASTM F477.

.3 Maximum installed deflection not to exceed 7.5% of the base inside diameter.

2.2 PIPE BEDDING AND SURROUND MATERIAL

.1 General requirements for granular pipe bedding are as per Section 31 00 99 articles 2.1.1 or 2.1.2

.2 Gradation requirements for granular pipe bedding are as per Section 31 00 99 article 2.1.4 (type 1 gradation).

.3 Concrete encasement, where noted on drawings, to be minimum 20MPa, with constituent materials in conformance to CAN/CSA-A5, A23.5 and A23.1.

2.3 BACKFILL MATERIAL

.1 As per Section 31 00 99 item 2.1 (applicable articles).

Part 3 Execution

3.1 PREPARATION

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Department Representative.

3.2 TRENCHING

.1 In performing the following (and all) operations, comply with all recommendations of the report: Keystone Environmental Ltd; Mission Medium Institution Perimeter Road Repaving; Environmental Effects Evaluation; November 2017

- .1 Eliminate water ingress from entering trench from adjacent water bodies.
- .2 Perform environmental salvage.
- .3 Dewater excavations as required and dispose of trench water as approved.

.2 Do not allow contents of sewer or sewer connection to flow into trench.

.3 Trench alignment and depth as shown on Contract Drawings.

.4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by the Department Representative.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in a uniform layer not exceeding 150 mm compacted thickness, surround material compacted with a hand compactor.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.

.4 Compact each layer full width of bed to minimum 95% Modified Proctor Density in compliance with ASTM D1557.

.5 Shape transverse depressions as required to suit joints.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

3.4 INSTALLATION

.1 Handle pipe in accordance with manufacturer’s recommendations. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends.

.2 Lay and join pipes to manufacturer’s instructions and specifications except as noted otherwise herein. PVC pipe to CSA B182.11.

.3 Install Pipes to the following tolerances:

Horizontal tolerances: plus or minus 25 mm from specified alignment;

Vertical tolerances: plus or minus 10 mm from specified grade. Reverse grade is not acceptable.

.4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Pipes on curved alignments:

.1 Smooth profile PVC pipe: for 100 mm to 300 mm sizes conform to required curvature by bending pipe barrel. In no case is radius of curvature to be less than 300 times outside diameter of the barrel. Joint deflection not permitted for smooth profile PVC pipe.

.7 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Whenever work is stopped, install removable watertight bulkhead at open end of last pipe laid to prevent entry of water and foreign materials.

.8 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe and leave smooth end at right angles to axis of pipe.

.9 Joints:

.1 Install gaskets as recommended by manufacturer on all pipe unless specified otherwise.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes carefully before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.10 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise specified.

.11 When any stoppage of work occurs, restrain pipes in an approved manner to prevent "creep" during down time.

.12 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available. Core neat circular holes in walls of existing manholes. Do not hammer or chip except as approved by the Department Representative.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within 1 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to underside of pipe to at least 95 % Modified Proctor

.6 Surround material should be compacted with a hand compactor.

3.6 BACKFILL

.1 Place backfill material in unfrozen condition and in accordance with Section 31 00 99 article 3.4.

3.7 FIELD TESTING

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Acceptable Ponding: Mainline PVC sewers; 300 mm diameter or less: 20 mm maximum ponding over 3m length of pipeline.

.3 Remove foreign material from sewers and related appurtenances by flushing with water.

.4 Flushings to be vacuum pumped for disposal offsite to prevent foreign material, silts etc., from entering interceptors, filter chambers and soakaways. Offsite disposal to comply with environmental legislation / bylaws.

.5 Television and photographic inspections:

.1 Immediately after flushing, carry out inspection of installed sewers by television camera and provide the Departmental Representative with two copies of inspection report and DVD recorded, logged, produced and coded in accordance with the standards of the Water Research Centre (WRc) / NASSCO Pipeline Assessment Certification Program (PACP).

.2 Provide means of access to permit Departmental Representative to do inspections.

END OF SECTION

APPENDICES

REPORT

October 31, 2013

GEOTECHNICAL INVESTIGATION

Perimeter Road Improvements
Mission Institution
Mission, BC

Submitted to:
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Report Number: 1114470264-020-R-Rev0 7000
Distribution:

2 Copies - PWGSC

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Golder Associates

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

As requested, Golder Associates Ltd. (Golder) carried out a geotechnical investigation along the existing perimeter road at the Mission Institution in Mission, BC. The purpose of the investigation was to determine the shallow soil and groundwater conditions at the site and based on this information provide geotechnical comments and recommendations as input to the pavement design of the perimeter road.

The scope of this report is limited to the geotechnical engineering aspects of the existing perimeter road, and does not include any provision for the sampling, testing or investigation of the soils or groundwater for contamination, or the provision of bioscience related consulting services or archaeological assessments for this site. Golder has the capability and will be pleased to provide such specialist services, if requested.

This report should be read in conjunction with the "***Important Information and Limitations of This Report***" which is appended following the text of the report. The reader's attention is specifically drawn to this information as it is essential that it be followed for the proper use and interpretation of this report.

2.0 BACKGROUND AND PROPOSED ROAD UPGRADES

The Mission Institution is located west of Stave Lake Street in Mission, BC. The Institution is bound to the north by Ferndale Avenue and to the south by Dewdney Trunk Road. The perimeter road is about 1.1 km in length and has an asphalt riding surface. For the purposes of this report, the four sections of perimeter road are referred to as the east, west, north and south sections. It is understood that the existing perimeter road was constructed about 20 years ago. The site slopes downward gently from west to east and there is about a 10 m difference in elevation between the west and east sections of the perimeter road, with the east section of perimeter road at the low end of the site, adjacent to a wetland.

Based on our visual inspection, the existing perimeter road along the west, north and south sections is considered to be in a reasonably fair condition given its' age. The east section of perimeter road, at the low end of site, is in a poor condition exhibiting distress at numerous locations in the form of asphalt cracking and sloughing along the outside edges of the asphalt road surface, as well as, several transverse cracks at locations where culverts/utility pipes cross beneath the road. Several patches in the existing asphalt suggest that previous repairs have occurred. Some minor localized rutting has also occurred within the shoulder adjacent to the edge of the asphalt in some areas. Despite the observed distress, which is mostly along the east edge of the perimeter road, the eastern most section of perimeter road remains functional; however, it will continue to deteriorate with time. It is understood that PWGSC would like to upgrade and improve the roadways.

3.0 BENKELMAN BEAM SURVEY

The structural strength of the pavement structure was evaluated using a Benkelman Beam apparatus on September 16, 2013. The apparatus utilizes a standard single rear axle truck loaded with 80 kN on its rear axle. While the pavement deflections on the west, north and south sections of the perimeter road were taken at about 5.5 m intervals staggered over inner and outer wheel paths, the interval was reduced to about 2.5 m in the case of the east side road in view of poor surface condition of the existing asphalt. The deflection readings obtained were corrected by applying temperature correction and seasonal correction factors. The data was then

statistically analyzed to obtain the Most Probable Spring Rebound (MPSR) of the four pavement sections. A summary of the statistical analysis is presented in Table 1.

Table 1: Summary of Statistical Analysis of Benkelman Beam Survey Data

Road Section	Deflection (mm)					
	Number of Readings	Minimum	Maximum	Mean	Standard Deviation	MPSR
West	54	0.06	0.42	0.18	0.08	0.35
North	44	0.12	0.97	0.45	0.20	0.85
East	91	0.18	1.21	0.61	0.22	1.05
South	49	0.18	1.03	0.45	0.18	0.81

From the deflection analysis, the outlier readings (i.e. readings outside of the mean plus two (2) standard deviations) have been excluded. Individual deflection readings are presented graphically for each section of the perimeter road in Appendix A.

These roads are subjected to low intensity of light vehicular traffic. Such roads are considered to be the equivalent of 'Local Residential' roads. A typical maximum allowable MPSR for a 'Local Residential' asphalt paved road in various municipalities of the Lower Mainland and Fraser Valley is 1.50 mm. The MPSR of all the four road sections is less than the maximum allowable MPSR.

4.0 GEOTECHNICAL INVESTIGATION

On September 30, 2013, Golder carried out a drilling investigation along the perimeter road using a truck-mounted auger drill rig owned and operated by Downrite Drilling Ltd. of Chilliwack, B.C. at the approximate locations shown on Figure 2. The investigation program consisted of drilling seventeen (17) solid stem augerholes designated as AH/DCPT13-01, AH13-02 to AH13-04, AH/DCPT13-05, AH13-06, AH13-07, AH/DCPT13-08, AH13-09, AH/DCPT13-10, AH/DCPT13-11, AH13-12, AH/DCPT13-13, AH13-14, AH/DCPT13-15, AH13-16 and AH/DCPT13-17. The augerholes were advanced to depths up to about 4.6 m below the existing ground surface. It should be noted that the augerhole locations were determined following the Benkelman Beam Survey and given that somewhat softer subgrade conditions were anticipated along the east section of the perimeter road (adjacent to the existing wetland) and the higher deflection readings obtained along that same section of road, a higher concentration of augerholes were put down along the east section of the perimeter road.

In addition, eight (8) Dynamic Cone Penetration Test (DCPT) probes were put down in advance of eight (8) augerholes to depths ranging between about 3.1 and 5.2 m below the existing ground surface. The DCPT probes were put down to obtain information on the relative penetration resistance of the various subsurface strata and from this, to infer consistency or relative density of the various strata encountered. The DCPT probe

was advanced using a 63.5 kg (140 lb) automatic trip hammer (rated efficiency of 95%) and AWJ drill rods to advance a 73 mm diameter cone (with a 60 degree cone angle and blunt centre) located at the bottom of a 154 mm long sleeve. The geometry of the cone, which slides onto the end of the drill rods and is left down in the testhole at the end of the test, has been designed to produce DCPT blow counts that are approximately equivalent to N60 blow counts from the Standard Penetration Test (SPT). DCPT blow counts (blows per 0.3 m) are included on the Record of Augerhole Log sheets.

The fieldwork was carried out under the full-time inspection of a member our geotechnical staff, who located the augerholes in the field, logged in detail the soil and groundwater conditions encountered in each of the augerholes, recorded the blow counts per 0.3 m advance of the DCPT probe, and collected representative soil samples for further detailed examination and index testing in Golder's Abbotsford laboratory. The augerholes were backfilled and sealed in accordance with current groundwater protection legislation.

The approximate location coordinates for each augerhole were measured using a handheld Global Positioning System (GPS) and are noted on the Record of Augerhole Log sheets.

4.1 Laboratory Testing

Laboratory testing, comprising moisture content determinations, was carried out on fourty-eight (48) samples of the material that was collected from the augerholes. In addition, particle size distribution tests were performed on four (4) samples of the material collected from AH/DCPT13-01, AH/DCPT13-08, AH/DCPT13-10 and AH13-14. One (1) Atterbergs Limits test was also performed on a sampled collected from AH13-12.

5.0 SUBSURFACE CONDITIONS

Detailed descriptions of the soil and groundwater conditions encountered in the augerholes are presented in the Record of Augerhole Log sheets following the text of this report. In general, the subsurface conditions along the perimeter road consist of a layer of asphalt underlain by variable surficial fills and/or topsoil, underlain by deposits of sand, sand and silts and/or clayey silt to silty clay. Some variations in the subsurface conditions were noted between the augerhole locations. Similar, and possibly greater, variations in subsurface conditions should be anticipated across the site. The following sections summarize the soil conditions encountered in the augerholes.

5.1 Asphalt

Asphaltic concrete was encountered at the surface in all of the augerholes. The thickness of the asphaltic concrete generally ranged between about 50 and 100 mm.

5.2 Fill

Fill material of variable composition and thickness was encountered directly below the asphaltic concrete in all of the augerholes, except AH13-04. The fill thickness ranged from about 0.1 to 1.7 m.

Water content determination testing carried out on several samples of the fill deposits indicate a natural moisture content that ranges between about 5 and 33 per cent, with an average of about 16 per cent. In addition, four (4) particle size distribution tests were performed and indicated values between about 4 to 60% gravel, 35 to 61% sand and 5 to 45% silt. The results of the particle size distribution tests are provided in Appendix B. Based on the observed resistance to auger drilling and DCPT probe advance, the existing fill that underlies the asphalt is inferred to generally range from loose to very dense, with the majority of the fill materials have a compact relative density.

5.3 Topsoil

Topsoil generally consisting of clayey silt with trace amounts of sand and organics were encountered in AH13-06 to AH13-09 and AH/DCPT13-11 to AH/DCPT13-17. A topsoil layer consisting of organic silt was also encountered in AH/DCPT13-01. The topsoil was encountered directly beneath the fill materials. The topsoil thickness ranged from about 0.1 to 0.9 m.

Water content determination testing carried out on several samples of the topsoil deposits indicate a natural moisture content that ranges between about 33 and 108 per cent, with an average of about 66 per cent. Based on the observed resistance to auger drilling and DCPT probe advance, the topsoil was inferred to be generally soft to firm.

5.4 Sand

Deposits of sand with trace to some silt were encountered in AH/DCPT13-01 and AH/DCPT13-17. In AH/DCPT13-01, the sand deposit was encountered directly below the topsoil and extended to a depth of about 2.9 m below the existing ground surface. Layers of coarse sand and fine gravel were also encountered within this sand deposit between about 1.4 and 2.9 m depth below the existing ground surface. In AH/DCPT13-17, sand deposits were encountered between about 1.5 m and the termination depth of 3.1 m below the existing ground surface.

A water content determination test carried out on a sample of the sand deposits indicated a natural moisture content of about 17%. Based on the observed resistance to auger drilling, the sand deposits were inferred to be generally compact to dense.

5.5 Clayey Silt to Silty Clay

Strata consisting of clayey silt to silty clay with trace to some amounts of sand were encountered in all of the augerholes, except AH13-02, AH13-03, AH13-04, AH/DCPT13-05 and AH/DCPT13-17. Trace amounts of gravel and organics were also encountered within this stratum in AH13-07. In AH/DCPT13-08, this stratum was layered with sand between about 2.1 and 2.9 m below the existing ground surface and consisted of a sandy clayey silt between about 2.9 m and the termination depth of 3.1 m below the existing ground surface. In AH13-09, the clayey silt to silty clay strata was interlayered with sand and gravel between about 1.7 m and the termination depth of 3.1 m below the existing ground surface. The majority of the clayey silt to silty clay strata were encountered directly below the topsoil or fill layers, except in AH/DCPT13-01. In AH/DCPT13-01, the

clayey silt to silty clay deposits were encountered directly below the sand deposits. AH/DCPT13-01, AH/DCPT13-08, AH13-09, AH13-12 and AH13-16 were all terminated within the clayey silt to silty clay deposits at about 3.1 m below the existing ground surface.

Water content determination testing carried out on several samples of the clayey silt to silty clay deposits indicate a natural moisture content that ranges between about 25 and 55 per cent, with an average of about 39 per cent. The results of an Atterberg limits test carried out on a sample of the clayey silt to silty clay indicated a value of about 34 per cent for the liquid limit and about 23 per cent for the plastic limit. The plasticity index of this clayey silt to silty clay material was about 11 per cent. The results of the Atterbergs Limits test are provided in Appendix B. Based on the observed resistance to auger drilling, the clayey silt to silty clay deposits were observed to range from soft to stiff, depending on the location encountered.

5.6 Sandy Silt, Silty Sand and Silt and Sand

Strata consisting of variable amounts of silt and sand with trace to some amounts of gravel were encountered in all of the augerholes, except AH/DCPT13-01, AH/DCPT13-08, AH13-09, AH13-12 and AH13-16. These strata were encountered directly below the surficial fill materials or the clayey silt to silty clay deposits in all of the augerholes where these deposits were encountered, except AH13-04 and AH/DCPT13-17. In AH13-04, these deposits were encountered directly below the asphaltic concrete and in AH/DCPT13-17; these deposits were encountered directly below the topsoil layer. All of the augerholes, where these variable silt and sand strata were encountered, were terminated within these strata, except for AH/DCPT13-17.

Water content determination testing carried out on several samples of the variable silt and sand deposits indicate a natural moisture content that ranges between about 11 and 26 per cent, with an average of about 16 per cent. Based on the observed resistance to auger drilling, the variable sand and silt deposits ranged between loose and very dense, depending on the location encountered.

5.7 Groundwater Conditions

Groundwater was observed in all of the augerholes at the time of drilling, except AH/DCPT13-01, AH/DCPT13-08 and AH13-12. The groundwater was encountered between about 0.5 and 2.1 m below the existing ground surface. We anticipate that the groundwater level at the site may fluctuate in response to seasonal fluctuations in precipitation and runoff, possibly rising during and following periods of extended wet weather and/or due to fluctuations in nearby watercourses and wetlands. In addition, it is anticipated that "perched" water levels may develop above silty materials during and following periods of sustained wet conditions. It is anticipated that all or part of the pavement structure along the east section of the perimeter road becomes saturated during the late fall, winter and early spring when water levels are higher in the adjacent wetland and drainage ditches.

6.0 GEOTECHNICAL ENGINEERING COMMENTS

6.1 General

As indicated above, the results of our geotechnical investigation indicate that the general shallow soil profile at the site consists of a layer of asphalt underlain by variable surficial fills and/or topsoil, underlain by deposits of sand, sand and silts and/or clayey silt to silty clay. During the late fall, winter and early spring, it is anticipated that the east section of the perimeter road becomes saturated with increased water levels in the adjacent wetland and drainage ditch.

The following sections provide our geotechnical engineering comments and recommendations as input to improvements to the perimeter road.

6.2 Existing Pavement Structure

It is understood that the existing perimeter road was constructed about 20 years ago. The results of the Benkelman Beam Survey indicate that the structural strength of the pavement structure is considered satisfactory from a deflection perspective. However, it is noted that the highest deflections and MPSR were obtained along the east section of the perimeter road which is consistent with the somewhat softer and wetter subgrade soil conditions adjacent to the existing wetland.

6.2.1 West, North and South Sections

Visual inspections carried out in November 2012 and September 2013 indicates that the condition of the west, north and south sections of the existing perimeter road is generally poor to fair. The pavements exhibit isolated alligator cracking of asphalt and transverse/longitudinal joints and exposed aggregate in general, due to loss of binder from the surface over a period of time. The augerhole results indicate that the existing pavement structure was originally constructed with a granular base that varies in thickness from non-existent at AH13-04 to as much as about 0.7 m at AH13-16, but for the most part about 0.2 m or less.

6.2.2 East Section

Visual inspections carried out in November 2012 and September 2013 indicate that the east section of the perimeter road, adjacent to the existing wetland, is generally in poor condition. Edge cracking and some subsidence was observed along both edges of the asphalt pavement at a number of locations as well as alligator cracking of asphalt and transverse cracks at numerous locations where existing drainage pipes are located beneath the road. The augerhole results indicate that the existing pavement structure was originally constructed with a granular base that varies in thickness from about 0.1 to 0.5 m, but for the most part about 0.2 m or less.

6.3 Existing Subgrade Condition

6.3.1 West, North and South Sections

The results of the augerholes put down along the west, north and south sections of the perimeter road indicate that the subgrade conditions are highly variable ranging from 0.9 m of firm clayey silt topsoil at one augerhole location to compact silt and sand. The augerhole results also indicated that in general, the topsoil that was left in place beneath the existing pavement structure has a firm consistency. The native sand and silt and sand subgrade soils are compact and the clayey silt to silty clay subgrade soils are firm.

6.3.2 East Section

The results of the augerholes put down along the east section of the perimeter road indicate that the subgrade conditions directly beneath the pavement structure are highly variable ranging from soft to firm clayey silt topsoil to compact sand fill. Groundwater levels observed in the open augerholes along this section of road adjacent to the existing wetland varied from about 1 to 2 m below the existing road surface in September which is generally considered to the driest part of the year. It is anticipated that during the late fall, winter and early spring, water levels in the adjacent wetland and drainage ditches will rise resulting in saturation of the road subgrade and overlying pavement structure.

6.4 Recommendations for Perimeter Road Improvements

The following sections provide geotechnical recommendations for improvements to the existing perimeter road based on the results of our visual inspection of the asphalt road surface, Benkelman Beam Survey, augerhole investigation and our understanding that the road will continue to be subjected to low volume of light vehicular traffic (i.e. pick-up trucks, vans, cars or similar).

6.4.1 West, North and South Sections

Based on the deflection data, immediate upgrading of the pavement of these sections is not required. However, in view of the observed worn-out asphalt surface of the existing road sections, it is recommended to install a minimum 35 mm thickness of asphalt overlay to improve the riding quality and prolong the life of the pavement.

Before installation of the overlay all visible distress should be repaired satisfactorily. All visible longitudinal/transverse cracks in the pavement should be repaired/sealed upon routing and removing any debris or organic growth therein. The alligator cracks should be repaired by removal of broken asphalt and patching with asphalt mix after compacting the exposed base and subgrade.

If a base or subgrade failure is noted at any location then sub-excavation to a competent subgrade and rebuilding of pavement up to existing asphalt surface will be required. It is recommended that the minimum pavement for such repair sections prior to installation of overlay consist of a minimum of 50 mm of asphalt underlain by 100 mm of granular base and 200 mm of granular sub-base over a prepared subgrade. All granular material should be compacted to at least 95% Modified Proctor Maximum Dry Density (MPMDD).

6.4.2 East Road

As previously noted, the augerhole results indicate the east section of road generally consists of an asphalt thickness that ranges between 60 and 80 mm underlain by a granular base that ranges between about 100 and 530 mm, all underlain by a highly variable subgrade from soft to firm clayey silt topsoil to compact sand/silt and sand fill. Given the subgrade conditions encountered, the granular base is considered to be deficient at most of the augerhole locations. Therefore, the following pavement improvement options are recommended for the east section of the perimeter road:

Option 1 – Mill and Pave

- Mill the existing asphalt pavement and dispose of off site;
- Inspect the exposed granular surface for any base or subgrade failures;
- Repair all failed areas by sub-excavating to a competent subgrade and restoring subgrade to the bottom of subbase elevation by:
  - placing select subbase or 75 mm minus pit run gravel and sand material and compacting to a minimum of 95% MPMDD;
  - installing a 200 mm thick granular subbase overlain by 100 mm thick granular base course compacted to a minimum of 95% MPMDD;
- Compact the entire exposed granular surface with a heavy roller and proof roll test. Any area showing excessive deflection should be sub-excavated to a competent subgrade followed by grade restoration and installation of granular pavement courses; and
- Install 85 mm thick asphalt pavement consisting of 35 mm Upper Course #2 underlain by 50 mm thick Lower Course #2 over the prepared granular base course.

Option 2 – Stabilization and Overlay

- Mill in place the existing asphalt pavement;
- Blend the millings in-place with at least 150 mm thickness of the underlying granular base course. Locations where the granular base thickness is less than 100 mm (AH13-08) would require sub-excavation to remove a portion of the underlying silt and sand to make space for additional quantity of granular base material. The blending of millings and existing base course and additional base course material will follow;
- Add stabilizing agent in prescribed dosage to the blended aggregate, mix well and compact the mixture in place to achieve 95% MPMDD;
- Allow the compacted stabilized course to cure; and
- Install 85 mm thick asphalt pavement consisting of 35 mm Upper Course #2 underlain by 50 mm thick Lower Course #2 over the prepared stabilized base as described above.

Option 3 – Raising of Pavement

It is understood that during the late fall, winter and early spring, water level in the adjacent wetland and ditch rises to within 0.5 m of the asphalt surface. To improve drainage and performance of the granular base, it is recommended that the road be raised by providing an additional 150 mm thickness of MMCD granular base course prior to placing (in two courses) a new 85 mm thick asphalt riding surface. Prior to placement of new granular base, the base failures or alligator cracked asphalt areas should be repaired by subexcavation to a competent subgrade and restoration with compacted granular material. The additional granular base material should be compacted to a minimum of 95% MPMDD.

It is also recommended that a 3 m wide strip of Tensar BX1200 geogrid be placed along the length of all existing drain pipes where transverse cracking of the existing road has occurred. The geogrid should be centered over the pipe and directly on top of the approved subgrade before any additional granular base is added to raise the road grade. The intent of the geogrid is to provide some tensile support within the granular fill over the existing drain pipes beneath the road and reduce the potential for cracking of the asphalt surface. The geogrid shall be installed in accordance with the manufacturer's recommendations.

Furthermore, it is recommended that a woven geotextile (Nilex 2006 or approved equivalent) be placed directly on top of the existing granular base prior to placement of the additional granular road base to act as a separator and to improve bearing resistance of the existing base as well as add some measure of lateral support to the edge of the road. The geotextile shall be installed in accordance with the manufacturer's recommendations.

It should be recognized that the addition of some granular base may induce some consolidation of the underlying subgrade and settlement of the road surface. Although the settlements are anticipated to be relatively uniform, it is recommended that a waiting period of about one month occur between placing the additional road base and construction of the asphalt riding surface.

6.4.3 Additional Comments

It should be recognized that all three (3) options will be disruptive to traffic. In terms of the order of preference from a geotechnical perspective and future performance, we recommend Option 3, then Option 2 and then Option 1. Option 3 raises the pavement structure and provides a level of improvement to the pavement structure by adding a base geotextile layer and some additional granular base while minimizing settlement potential due to loading from new fill. Option 3 will require grade transitions with the north and south sections of road. Option 2 will improve the pavement surface but will be prone to softening of subgrade due to subgrade and pavement saturation during periods of high water in the adjacent wetland and drainage ditches. However, Option 2 is anticipated to be better than Option 1 due to stabilization of the base.

It is recommended that the proposed site preparation and pavement design details and construction be reviewed by Golder prior to construction to confirm that they are consistent with the recommendations provided herein.

6.0 CLOSURE

We trust the information contained in this report is sufficient for your immediate requirements. Should you have any questions, please do not hesitate to contact us.

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

Craig Smith, E.I.T.
Geotechnical Group

ORIGINAL SIGNED

Brian L. J. Mylleville, Ph.D., P.Eng.
Principal and Senior Geotechnical Engineer

CS/BLJM/NC/lh

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IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

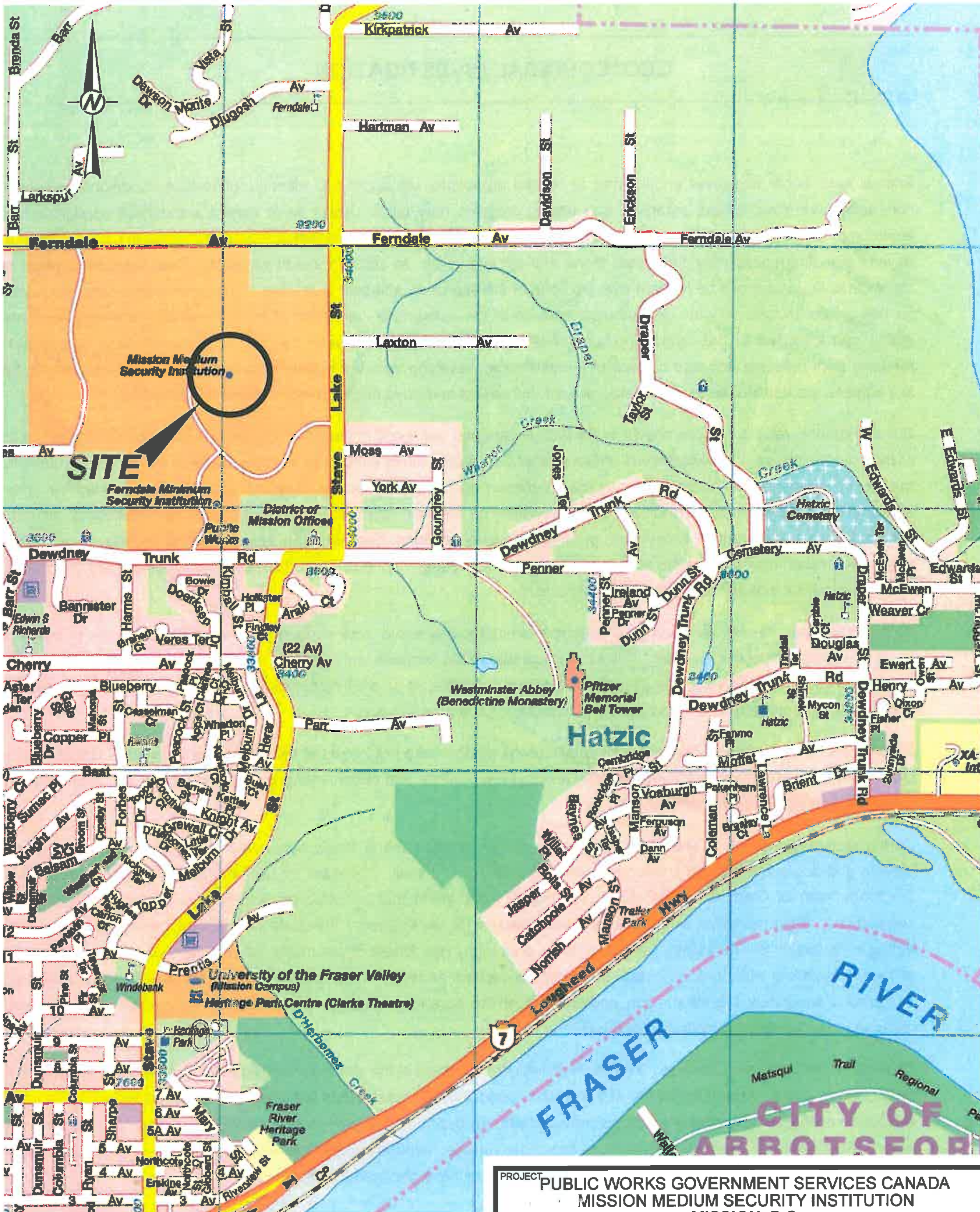
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

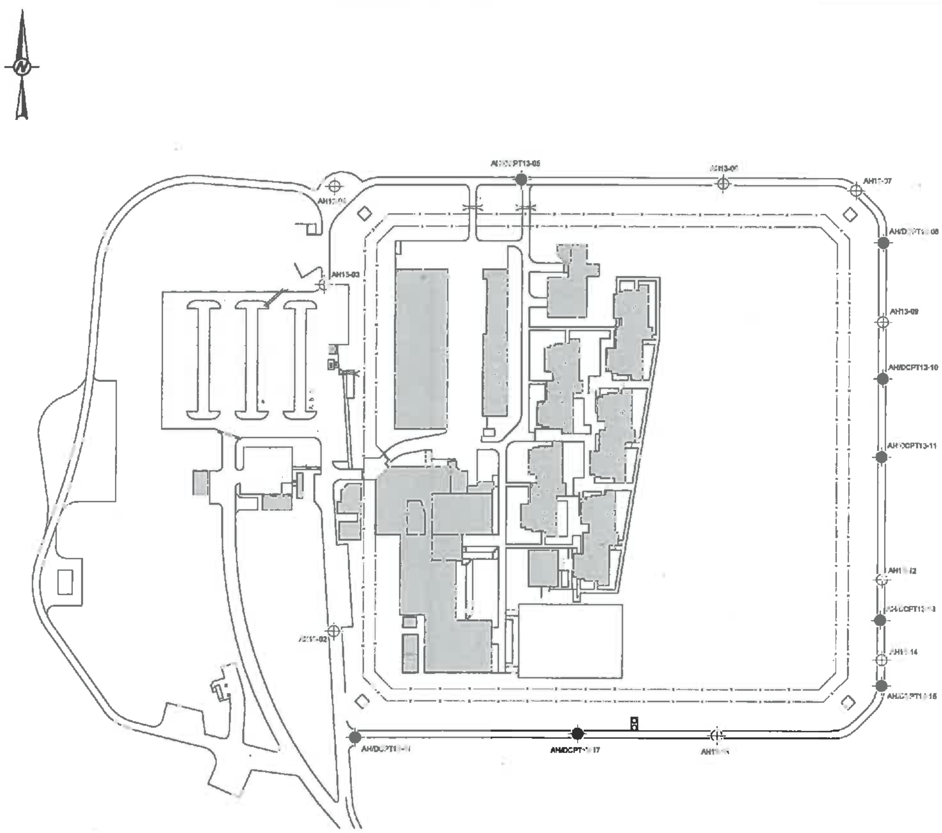
Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



0 400 800 1,200

SCALE (m)

PROJECT	PUBLIC WORKS GOVERNMENT SERVICES CANADA MISSION MEDIUM SECURITY INSTITUTION MISSION, B.C.				
TITLE	KEY PLAN				
Golder Associates	PROJECT No.	11-1447-0264.7000		FILE No.	1114470264.7000-01
	DESIGN	C.S.	2013-10-25	SCALE	AS SHOWN
	CADD	M.R.	2013-10-25	FIGURE	
	CHECK	C.S.	2013-10-31		1
	REVIEW	B.L.J.M.	2013-10-31		



LEGEND

APPROXIMATE LOCATION OF AUGERHOLE

APPROXIMATE LOCATION OF AUGERHOLE/DYNAMIC CONE PENETRATION TEST

REFERENCE

FILE Miss-site... DATED SEPTEMBER 25, ...

PROJECT: PUBLIC WORKS GOVERNMENT SERVICES CANADA
MISSION MEDIUM SECURITY INSTITUTION
MISSION, B.C.

TITLE

SITE PLAN

Golder Associates

PROJECT No.	11-14...		FILE No.	11-1478264-...
DESIGN		2013-...	SCALE	AS SHOWN
CADD	M.R.	2013-10-25	FIGURE	
CHECK		2013-10-31		2
REVIEW		2013-10-...		

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-01

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445803 E: ~551755
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-3} 10^{-4} 10^{-5} 10^{-6}) / WATER CONTENT PERCENT (Wp — W — Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.00								
		FILL - (SW/GP) SAND and fine GRAVEL, angular, some fines; grey; non-cohesive, moist, compact.		0.10	1	AS						
				0.30	2	AS						
		TOPSOIL - (OL) ORGANIC SILT, trace fine sand; black; cohesive, w>wp, firm.		0.46	3	AS						
1		(SP) fine SAND, some fines; light brown; non-cohesive, moist, compact.										No Groundwater Seepage Encountered in Open Hole.
		(SP and SP/GP) fine to medium SAND, and coarse SAND and fine GRAVEL, trace to some fines; grey, layered; non-cohesive, moist, compact to dense.		1.37	4	AS						
2												
3		(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; mottled grey-orange; cohesive, w>wp, firm to stiff.		2.90	5	AS				W = 59	M	
				3.05								
		End of Augerhole.										
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-02

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445856 E: ~551732
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■ Cu, kPa (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT Wp — W — Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill / Solid Stem Auger	Ground Surface												
		EXISTING PAVEMENT.		0.00										
		FILL - (SW/GP) SAND and fine GRAVEL, trace fines; grey-brown; non-cohesive, moist, dense.		0.10	1	AS								
				0.30	2	AS								
		FILL - (SW) gravelly SAND, some fines; brown; non-cohesive, moist, very dense.		0.76										
1		(ML/SM) SILT and SAND, trace gravel; mottled brown-orange; non-cohesive, moist, very dense.			3	AS						○		Water level observed in ▽ open hole during drilling
		(ML/SM) SILT and SAND, some gravel; mottled light brown-orange; non-cohesive, wet, compact to dense.		1.52	4	AS								
2														
		(ML/SM) SILT and SAND, trace gravel; grey; non-cohesive, moist, very dense.		2.74	5	AS						○		
3		End of Augerhole.		3.05										
4														
5														
6														
7														
8														
9														
10														

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-03

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5446026 E: ~551726
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-3} 10^{-4} 10^{-5} 10^{-6}) / WATER CONTENT PERCENT (Wp, W, Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.06								
		FILL - (SW/GP) SAND and fine GRAVEL, trace fines; grey; non-cohesive, moist, compact to dense.		0.30	1	AS						
1		FILL - (SM) gravelly SILTY SAND; dark brown-black; non-cohesive, moist, compact.		0.76								
		(ML/SM) SILT and SAND, trace gravel; mottled light brown-orange; non-cohesive, moist, compact.			2	AS				W		
2		(ML/SM) SILT and SAND, some gravel; mottled light brown-orange; non-cohesive, moist to wet, compact to dense.		1.52								Water level observed in open hole during drilling
					3	AS				W		
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-04

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5446080 E: ~551730
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DATUM: Local

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE – DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0		Ground Surface										
	Truck Mounted Auger Drill; Solid Stem Auger	EXISTING PAVEMENT.		0.05								
		(ML/SM) SILT and SAND, trace to some gravel; grey; non-cohesive, moist to wet, compact.										Water level observed in open hole during drilling
1					1	AS						
		(ML) fine sandy SILT, trace to some gravel; mottled light brown-orange; non-cohesive, wet, compact.		1.52								
2					2	AS				○ (~17)		
3		(ML/SM) SILT and SAND, trace gravel; grey; non-cohesive, wet, compact to dense.		2.90	3	AS				○ (~12)		
				3.05								
		End of Augerhole.										
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-05

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5446079 E: ~551822
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-2} 10^{-3} 10^{-4} 10^{-5}) / WATER CONTENT PERCENT (Wp, w, Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.08								
		FILL - (SW/GP) SAND and fine GRAVEL, trace fines; grey; non-cohesive, moist, compact.		0.23								
		(ML/SM) SILT and SAND, trace to some gravel; light brown; non-cohesive, moist, loose.			1	AS				○		
1		(ML/SM) SILT and SAND; mottled grey-brown; non-cohesive, moist, compact.		0.91	2	AS						Water level observed in open hole during drilling
		(SM) SILTY SAND; grey-brown; non-cohesive, wet, dense.		1.52	3	AS				○		
2												
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-06

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5446088 E: ~551924
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-2} 10^{-3} 10^{-4} 10^{-5}) / WATER CONTENT PERCENT (Wp, W, Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill / Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.08								
		FILL - (SP/GP) fine to medium SAND and fine GRAVEL, trace fines; grey; non-cohesive, moist, compact.		0.20	1	AS						
		FILL - (ML) sandy SILT, trace gravel; grey-brown; non-cohesive, moist, compact.		0.61	2	AS				○		
1		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (roots); dark-brown; cohesive, w>wp, firm.		0.91								
		(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; mottled light brown-orange; cohesive, w>wp, firm to stiff.			3	AS				○		
		(ML) sandy SILT; light brown; non-cohesive, wet, compact.		1.83	4	AS						Water level observed in open hole during drilling
2												
					5	AS						
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-07

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5446088 E: ~551986
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Pocket Pen - ■; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, w, Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.08								
		FILL - (SW/GP) SAND and fine GRAVEL, trace fines; grey; non-cohesive, moist, compact.		0.23								
		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (wood); grey-brown; cohesive, w>wp, soft to firm.			1	AS				53		
1		(ML) CLAYEY SILT, trace to some fine sand, trace gravel and organics (wood); brown; cohesive, w>wp, soft to firm.		0.91	2	AS				55		Water level observed in open hole during drilling
		(SM) SILTY SAND, trace gravel; grey; non-cohesive, wet, compact.		1.37	3	AS						
2		(ML) sandy SILT; grey; non-cohesive, moist, compact.		2.13	4	AS						
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-08

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5446054 E: ~552005
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-2} 10^{-3} 10^{-4} 10^{-5}) / WATER CONTENT PERCENT (Wp, W, Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.										
		FILL - (SW/GP) SAND and fine GRAVEL, trace fines; grey; non-cohesive, moist, compact.		0.15	1	AS					M	
		FILL - (ML/SM) SILT and SAND, some gravel; grey; non-cohesive, moist, loose.		0.61								
1		FILL - (ML/SM) SILT and SAND, trace gravel; grey; non-cohesive, moist, compact to dense.			2	AS						No Groundwater Seepage Encountered in Open Hole.
		FILL - (ML/SM) SILT and SAND; grey; non-cohesive, moist, compact.		1.52	3	AS						
2		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (roots/grass/wood); dark brown; cohesive, w>wp, firm.		1.83	4	AS					103	
		(ML/CI and SP) CLAYEY SILT to SILTY CLAY, trace fine sand and coarse SAND; grey, layered; cohesive, w>wp, firm to stiff.		2.13	5	AS						
3		(ML) sandy CLAYEY SILT, trace gravel; grey; cohesive, w>wp, very stiff.		2.90	6	AS						
		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-09

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5446013 E: ~552011
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Pocket Pen -, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10⁻⁶ 10⁻⁵ 10⁻⁴ 10⁻³) / WATER CONTENT PERCENT Wp W Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.06								
		FILL (SW/GP) SAND and fine GRAVEL, angular, trace fines; grey; non-cohesive, moist, compact.		0.22	1	AS						
		FILL - (SM) SILTY SAND, some gravel; brown; non-cohesive, moist, compact.		0.76	2	AS						
1		FILL - (SW) SAND, some fines; grey; non-cohesive, moist, dense.		0.91	3	AS				W = 8%		Water level observed in open hole during drilling
		TOPSOIL - (ML) CLAYEY SILT, some fine sand, trace organics (roots); brown; cohesive, w>wp, firm.		1.22	4	AS						
		(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; dark grey; cohesive, w>wp, firm to stiff.		1.68								
2		(ML/CI and SP/GP) CLAYEY SILT to SILTY CLAY, and coarse SAND and fine GRAVEL; grey, layered; cohesive, w>wp, firm to stiff.			5	AS						
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-10

SHEET 1 OF 1

DATUM: Local

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445984 E: ~552003
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

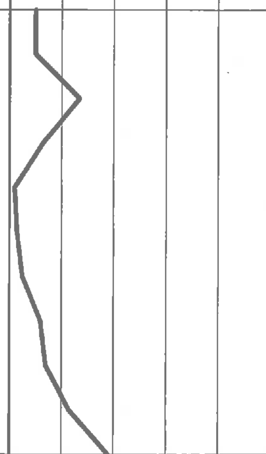
INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

BORING METHOD: Truck Mounted Auger Drill — Solid Stem Auger

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	HYDRAULIC CONDUCTIVITY / WATER CONTENT	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Ground Surface						
	EXISTING PAVEMENT.	0.08					
	FILL - (SW/GW) SAND and GRAVEL, subrounded to subangular, trace fines; brown; non-cohesive, moist to wet, compact.		1	AS	○	M	Water level observed in open hole during drilling
	(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; mottled grey-orange; cohesive, w>wp, firm to stiff.	0.61					
1			2	AS	○		
	(ML) sandy SILT, some gravel; brown; non-cohesive, wet, compact to dense.	1.52	3	AS	○		
2							
3			4	AS	○		
	End of Augerhole.	3.05					

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80)



SHEAR STRENGTH Cu, kPa: nat V. + Q - ● ; rem V. ⊕ U - ○ ; Pocket Pen - ■

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3})

WATER CONTENT PERCENT: Wp ⊢—○W—⊣ Wl (10, 20, 30, 40); NP - Non-Plastic

DEPTH SCALE 1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-11

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445950 E: ~552006
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Pocket Pen -, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.06								
		FILL - (SW/GW) SAND and GRAVEL, trace fines; brown; non-cohesive, moist, compact.		0.23	1	AS						
				0.46	2	AS						
		FILL - (ML) SILT, some sand, trace gravel; grey; non-cohesive, moist, compact.		0.61								
1		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (roots/wood); brown; cohesive, w>wp, soft to firm.										Water level observed in open hole during drilling
		(ML/Cl) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; grey; cohesive, w>wp, soft to firm.			3	AS						
				1.52	4	AS						
2		(ML/Cl) CLAYEY SILT to SILTY CLAY, trace fine sand; mottled grey with silt nodules; cohesive, w>wp, firm.										
		(ML/Cl) CLAYEY SILT to SILTY CLAY, trace fine sand; grey; cohesive, w>wp, firm.		2.13	5	AS						
		(ML) sandy SILT, trace gravel; grey; non-cohesive, wet, compact.		2.59	6	AS						
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-12

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445899 E: ~552003
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - ○ Pocket Pen - ■ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill / Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.06								
		FILL - (SW/GW) SAND and GRAVEL, trace fines; grey; non-cohesive, moist, compact.			1	AS						
		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (roots/wood); brown; cohesive, w>wp, soft to firm.		0.46	2	AS						
1		(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; grey; cohesive, w>wp, firm.		0.76	3	AS				W	A	No Groundwater Seepage Encountered in Open Hole.
2		(ML/CI) CLAYEY SILT to SILTY CLAY, some sand; grey; cohesive, w>wp, firm.		1.52	4	AS						
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-13

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445878 E: ~552008
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.06								
		FILL - (SW/GW) SAND and GRAVEL, subrounded, trace fines; brown; non-cohesive, moist, compact.		0.30								
		FILL - (SP) SAND, some gravel and fines; grey; non-cohesive, moist, compact.			1	AS						
1		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (roots); brown; cohesive, w>wp, soft to firm.		0.91	2	AS				100		Water level observed in open hole during drilling
		(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; grey; cohesive, w>wp, firm.		1.22	3	AS						
					4	AS						
2		(ML) sandy SILT; grey; non-cohesive, wet, loose to compact.		2.13								
					5	AS						
3												
4					6	AS						
		End of Augerhole.		4.57								
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-14

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445855 E: ~552007
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	SAMPLES RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-3} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill / Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.06								
		FILL - (SW/GW) SAND and GRAVEL, trace fines; grey-brown; non-cohesive, moist, compact.		0.20	1	AS				W	M	
		FILL - (ML/SM) SILT and SAND, trace gravel; grey; non-cohesive, moist, compact.										
1		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (wood); brown; cohesive, w>wp, firm.		0.91	2	AS				73		
		(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; grey; cohesive, w>wp, firm to stiff.		1.37	3	AS				W		
2		(ML) sandy SILT, trace gravel; grey; non-cohesive, wet, loose to compact.		1.98	4	AS				W		Water level observed in open hole during drilling
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-15

SHEET 1 OF 1

DATUM: Local

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445842 E: ~552010
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Pocket Pen - ■; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-2} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface												
		EXISTING PAVEMENT.		0.00										
		FILL - (SW/GW) SAND and GRAVEL, trace fines; grey-brown; non-cohesive, moist, compact.			1	AS								
				0.30	2	AS								
		FILL - (SP) SAND, some gravel and fines; grey; non-cohesive, moist, compact.		0.76										
1		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (roots/wood); brown; cohesive, w>wp, firm.			3	AS						108		
		(ML/CI) CLAYEY SILT to SILTY CLAY, trace fine sand; grey; cohesive, w>wp, stiff.		1.22	4	AS								
2		(ML) sandy SILT; grey; non-cohesive, wet, loose.		1.98										Water level observed in open hole during drilling
					5	AS								
3														
4		(ML/SM) SILT and SAND; grey; non-cohesive, wet, dense to very dense.		3.96	6	AS								
		End of Augerhole.		4.27										
5														
6														
7														
8														
9														
10														

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH13-16

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445811 E: ~551918
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp ⊢○ W ⊣ Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.06								
		FILL - (SW/GW) SAND and GRAVEL, trace fines; grey; non-cohesive, moist, compact.		0.20	1	AS						
		FILL - (SP) SAND, some fines and gravel; grey-brown; non-cohesive, moist, compact to dense.			2	AS						
1		TOPSOIL - (ML) CLAYEY SILT, trace fine sand and organics (roots); brown; cohesive, w>wp, firm.		0.84								
		(ML/Cl) CLAYEY SILT to SILTY CLAY, trace fine sand; brown; cohesive, w>wp, soft to firm.			3	AS						
2		(ML/Cl) CLAYEY SILT to SILTY CLAY, trace fine sand; grey; cohesive, w>wp, firm to stiff.		2.13	4	AS						
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

Water level observed in ▽ open hole during drilling

51

55

DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

File N: ACTIVE\YEAR 2011\1447\11-14 #7-0264 (PWGSC - GEOTECH SER\ICES - VARIOUS\TASK 7000 (MISSION INSTITUTION-PERIMETER ROAD)\INT DATABASE\11-14-#7-0264 (7000).GPJ Output Form:BC_BOREHOLE (AUTO) Template:BC REGION TEMPLATE BETA 3.GDT Library: BC REGION LIBRARY.GLB cmamin 10/28/13

PROJECT No.: 11-1447-0264 (7000)

RECORD OF AUGERHOLE: AH/DCPT13-17

SHEET 1 OF 1

CLIENT: PWGSC
PROJECT: Mission Institution - Perimeter Road
LOCATION: See Figure 2.
N: ~5445809 E: ~551861
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: September 30, 2013
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Truck Mounted Auger Drill, Solid Stem Auger	Ground Surface										
		EXISTING PAVEMENT.		0.08								
		FILL - (SW/SP) SAND and fine GRAVEL, trace fines; brown; non-cohesive, moist, compact.		0.30	1	AS						
1		TOPSOIL - (ML) CLAYEY SILT, trace fine sand, gravel and organics (roots/wood); brown; cohesive, w>wp, firm.			2	AS				W		
		(ML) sandy SILT, trace gravel; grey; non-cohesive, moist, compact.		1.22	3	AS				W		
2		(SP) fine to medium SAND, trace fines; grey; moist to wet, compact.		1.52	4	AS						Water level observed in open hole during drilling
3		End of Augerhole.		3.05								
4												
5												
6												
7												
8												
9												
10												

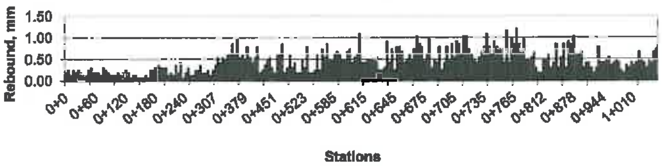
DEPTH SCALE
1 : 50

LOGGED: CS
CHECKED: DEN

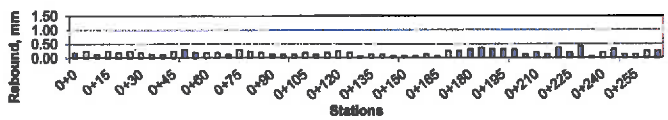
File N:\ACTIVE\EAR 2011\1447\11-1447-0264 (PWGSC - GEOTECH SER\ICES - VARIOUS)\TASK 7000 (MISSION INSTITUTION-PERIMETER ROAD)\GINT DATAB\SE\11-1447-0264 (7000).GPJ Output Form:BC_BOREHOLE (AUTO) Template: BC REGION TEMPLATE BETA 3.GDT Library: BC REGION LIBRARY.GLB cmsmith 10/28/13

APPENDIX A

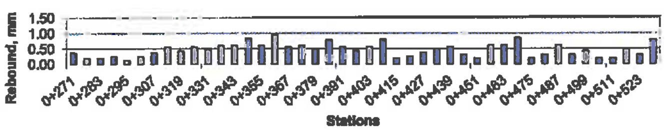
Benkelman Beam Survey – Location Map and Rebound Measurements



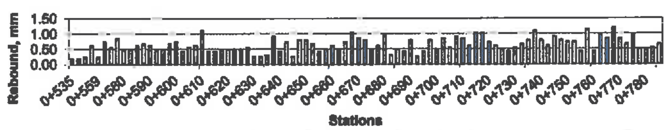
BENKELMAN BEAM READINGS (TOTAL)
NOT TO SCALE



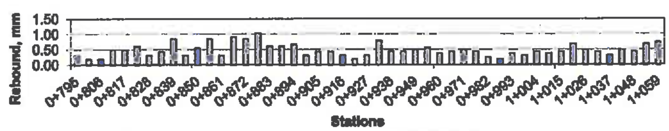
BENKELMAN BEAM READINGS (WEST ROAD)
NOT TO SCALE



BENKELMAN BEAM READINGS (NORTH ROAD)
NOT TO SCALE



BENKELMAN BEAM READINGS (EAST ROAD)
NOT TO SCALE



BENKELMAN BEAM READINGS (SOUTH ROAD)
NOT TO SCALE

TESTING LOCATION AND DIRECTION
NOT TO SCALE

PROJECT
PUBLIC WORKS GOVERNMENT SERVICES CANADA
MISSION MEDIUM SECURITY INSTITUTION
MISSION, B.C.

TITLE
BENKELMAN BEAM SURVEY RESULTS

Golder Associates

DESIGN			SCALE	AS SHOWN
	M R		FIGURE	A-1
REVIEW				

APPENDIX B

Laboratory Testing

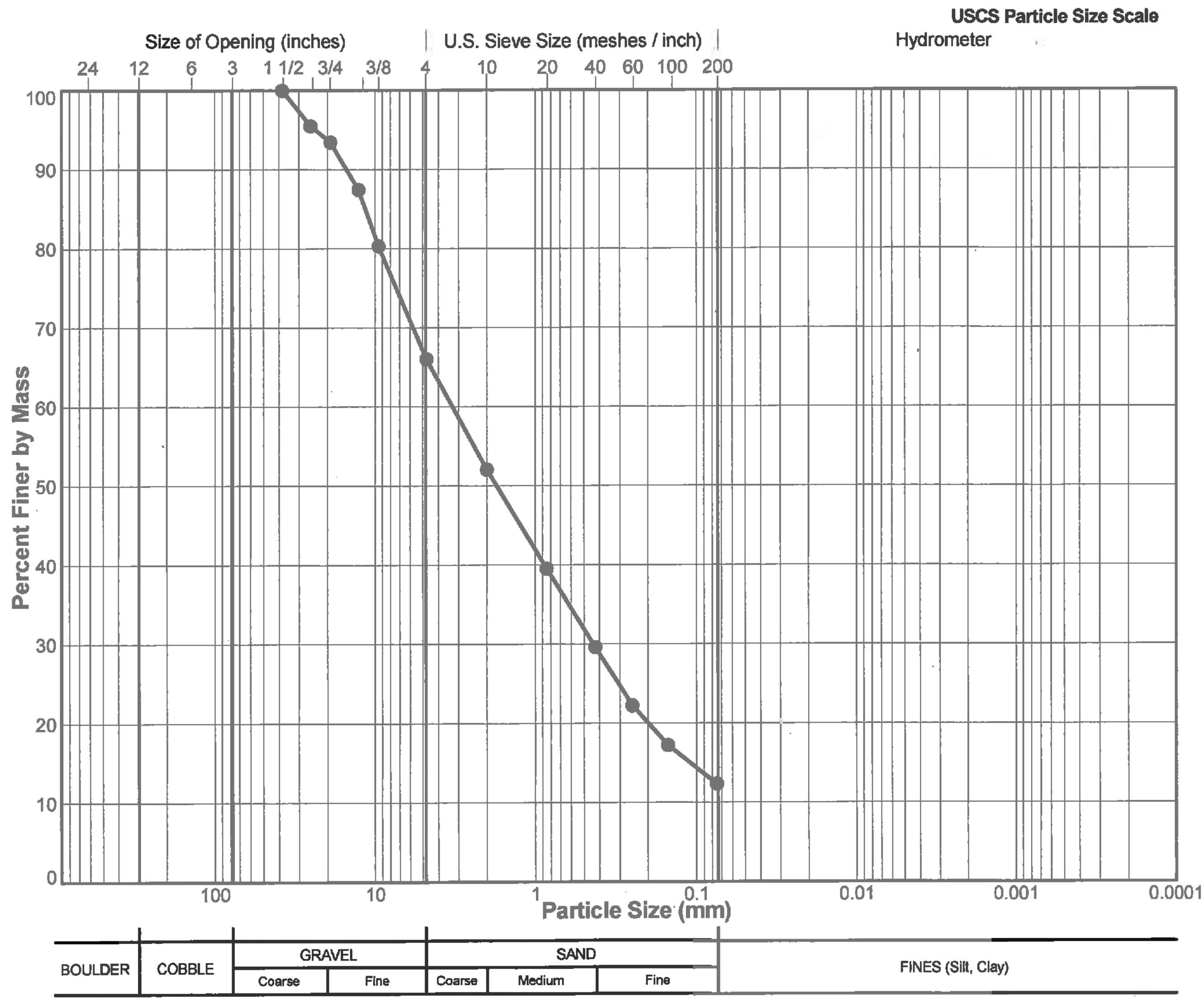
Golder Associates

PARTICLE SIZE ANALYSIS OF SOILS

Client:	PWGSC	**Reference(s)**	ASTM C 136, C 117
Project:	Mission Institution - Perimeter Road	**Augerhole ID:**	AH/DCPT13-01
Location:	Mission Institution, Mission	**Sample No.:**	1 Specimen: 1 Trial: 1
Project No.:	11-1447-0264 (7000)	**Depth Interval (m):**	0.15 to 0.30
		Lab Schedule No.:	13-25

Other Remarks: The sample size does not meet ASTM standards.

Specific Gravity (assumed):	**Shape:**
Max. Particle Size Passing (mm): 38.1	
Method: Split, Washed	



OA	10/17/2013	LH	10/22/2013
Tech	Date	Checked	Date

Golder Associates Ltd.
500 - 4260 Still Creek Drive Burnaby, British Columbia Canada V5C 6C6
Tel: (604) 296 4200 Fax: (604) 298 5253 www.golder.com

Golder Associates

PARTICLE SIZE ANALYSIS OF SOILS

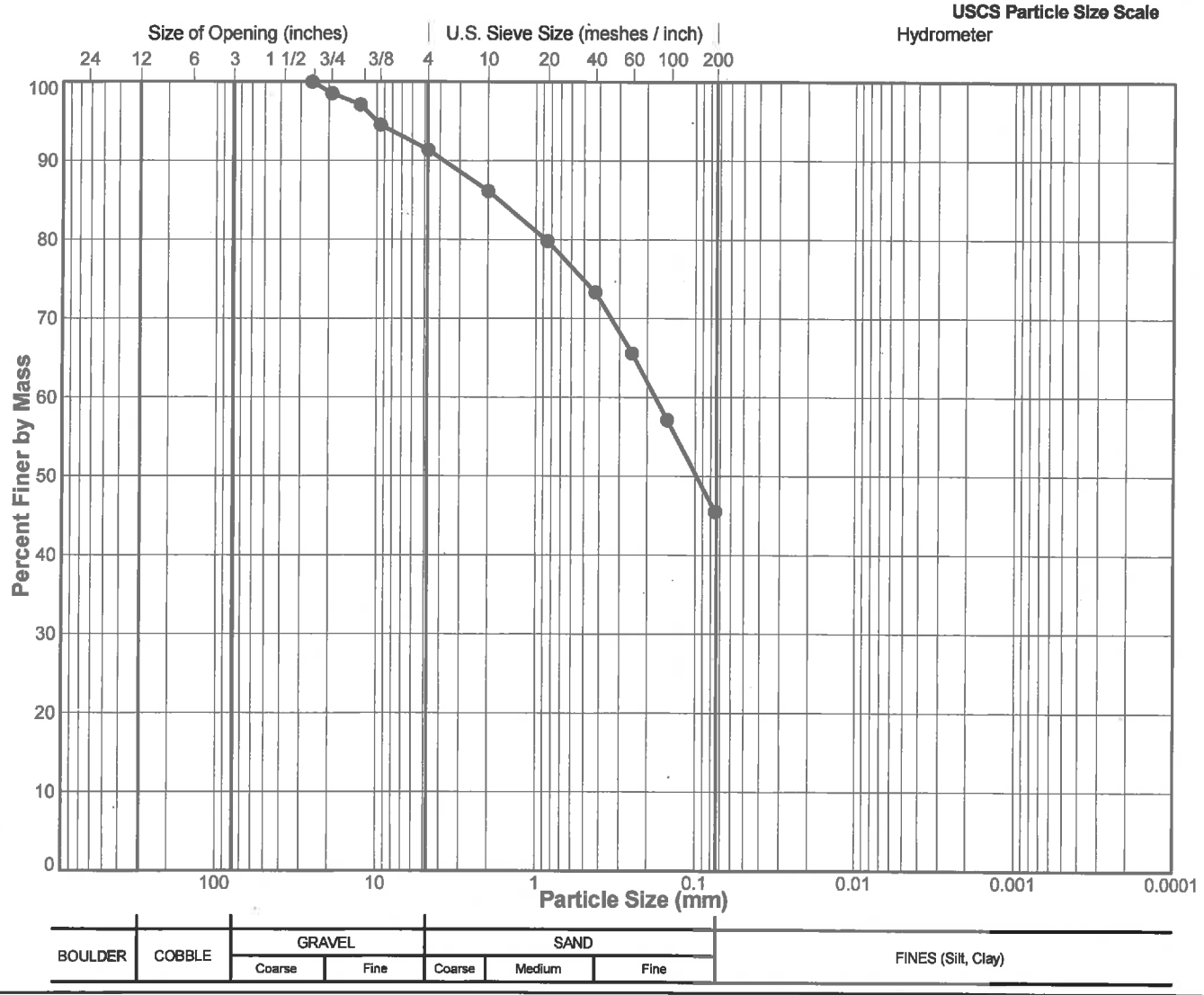
Reference(s)
ASTM C 136, C 117

Client: PWGSC	**Augerhole ID: AH/DCPT13-08**
Project: Mission Institution - Perimeter Road	**Sample No.: 1** Specimen: **1** Trial: **1**
Location: Mission Institution, Mission	**Depth Interval (m):** 0.30 to 0.61
Project No.: 11-1447-0264 (7000)	**Lab Schedule No.:** 13-25

Other Remarks: **The sample size does not meet ASTM standards.**

Specific Gravity (assumed):	**Shape:**
Max. Particle Size Passing (mm): 25.4	

Method: Split, Washed



OA	**10/17/2013**	**LH**	**10/22/2013**
Tech	Date	Checked	Date

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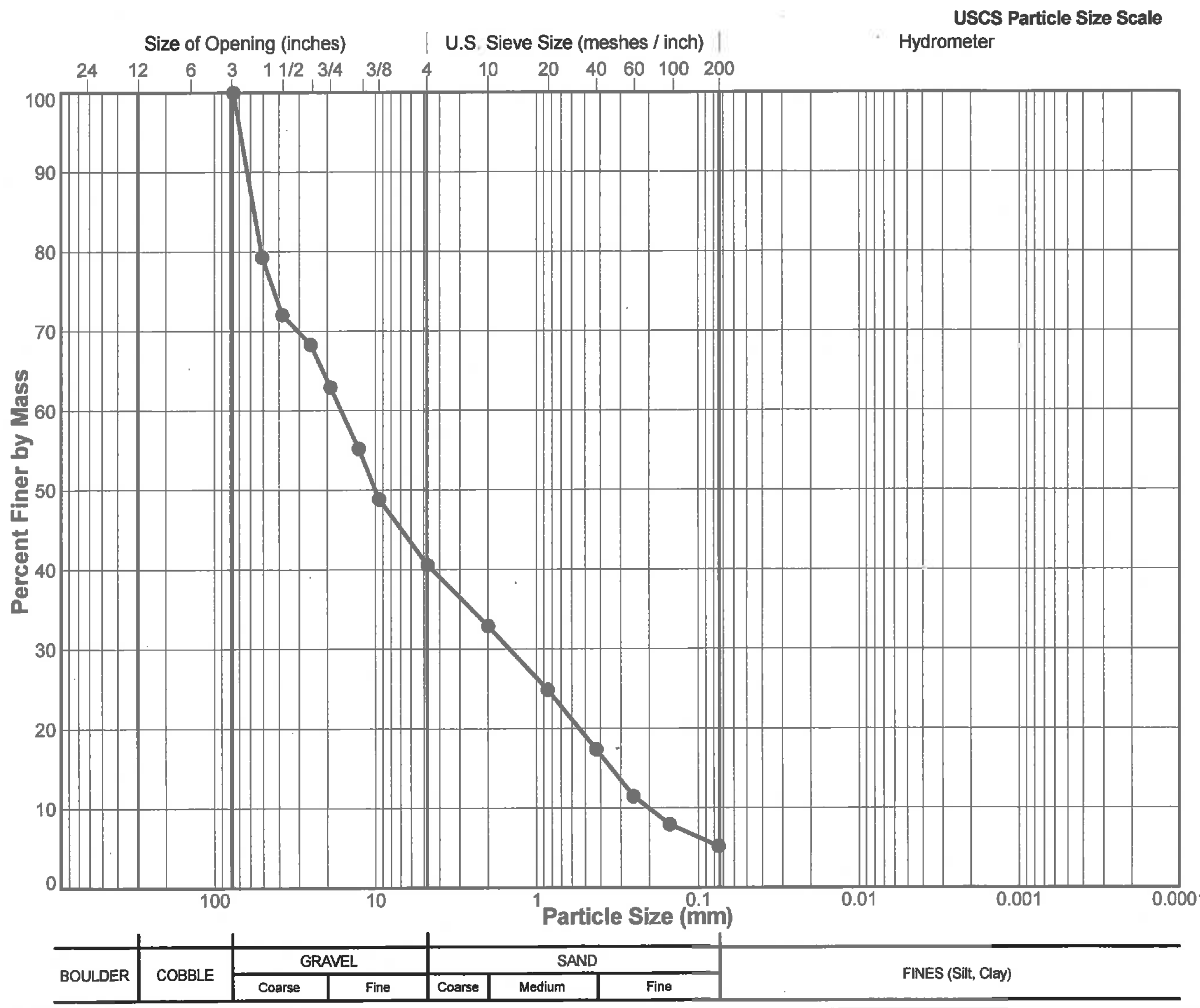
PARTICLE SIZE ANALYSIS OF SOILS	Reference(s) ASTM C 136, C 117
Client: PWGSC	**Augerhole ID: AH/DCPT13-10**
Project: Mission Institution - Perimeter Road	**Sample No.: 1** Specimen: **1** Trial: **1**
Location: Mission Institution, Mission	**Depth Interval (m):** 0.30 to 0.61
Project No.: 11-1447-0264 (7000)	**Lab Schedule No.:** 13-25

Other Remarks: **The sample size does not meet ASTM standards.**

Specific Gravity (assumed):	**Shape:**
Max. Particle Size Passing (mm): 76.2	
Method: Split, Washed	



OA/SJ	10/17/2013	LH	10/22/2013
Tech	Date	Checked	Date

PARTICLE SIZE ANALYSIS OF SOILS

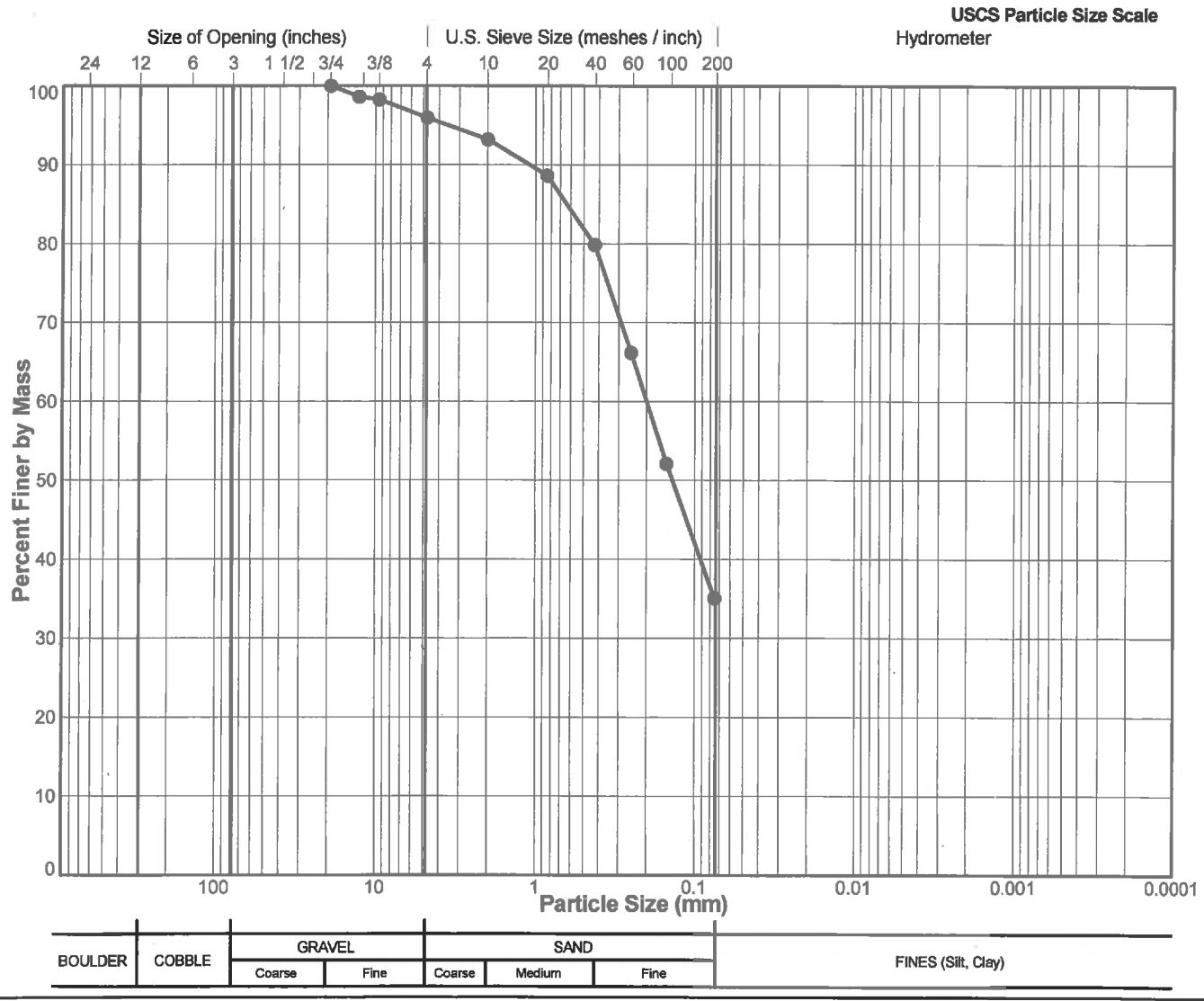
Reference(s)
ASTM C 136, C 117

Client: PWGSC	**Augerhole ID: AH13-14**
Project: Mission Institution - Perimeter Road	**Sample No.: 1** Specimen: **1** Trial: **1**
Location: Mission Institution, Mission	**Depth Interval (m):** 0.30 to 0.61
Project No.: 11-1447-0264 (7000)	**Lab Schedule No.:** 13-25

Other Remarks: **The sample size does not meet ASTM standards.**

Specific Gravity (assumed):	**Shape:**
Max. Particle Size Passing (mm): 19.1	

Method: Split, Washed



OA/SJ	**10/17/2013**	**LH**	**10/22/2013**
Tech	Date	Checked	Date

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LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

Reference(s)
ASTM D 4318-10

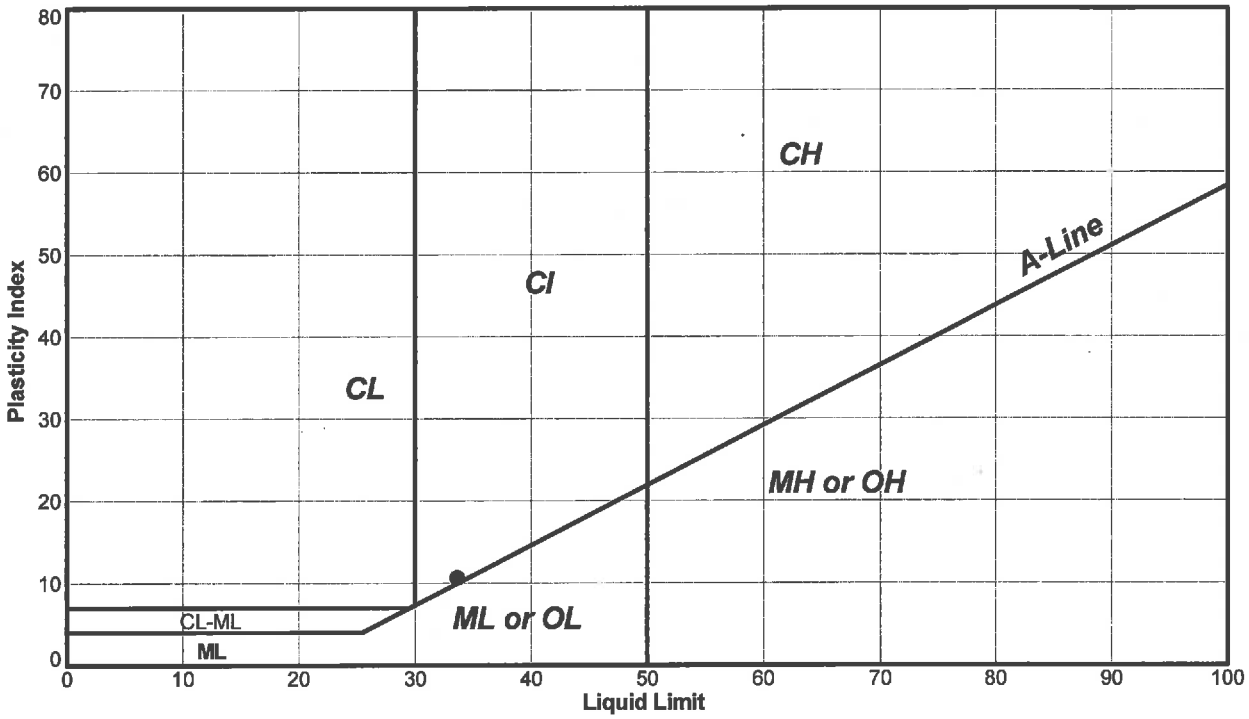
Client:	PWGSC	**Augerhole ID: AH13-12**
Project:	Mission Institution - Perimeter Road	**Sample No.: 3**
Location:	Mission Institution, Mission	**Depth Interval (m):** 1.22 to 1.52
Project No.:	11-1447-0264 (7000)	**Lab Schedule No.:** 13-25

Classification and Definition: CI - Inorganic SILTY CLAY of medium plasticity, sandy or gravelly SILTY CLAY.

Other Remarks: N/A

Test Method: A-Multi Point | **Preparation Method: Wet**

PLASTICITY CHART



Sym.	Sample Location	Sample / Specimen Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	AH13-12	3	1.22	1.52	ND	34	23	11	32.4	0.9

NP - NON-PLASTIC RESULT ND - NOT DETERMINED

Note: The test data given herein pertain to the sample provided only. This report constitutes a testing service only.

SJ	10/17/2013	LH	10/22/2013
Tech	Date	Checked	Date

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Golder Associates

Mission Medium Institution Perimeter Road Repaving Environmental Effects Evaluation

Libor Michalak R.P. Bio., P.Biol.
Keystone Environmental Ltd.
(November 2017)

Table of Contents

A. Project Identification

This section provides basic identification information for the project, its location, and the Authorities responsible for making the determination.

Project Title	Mission Medium Institution Perimeter Road Repaving Works
Project Location	Mission Institution, 8751 Stave Lake Street, Mission BC
Lead Authority	Correctional Service Canada
Contact name:	Mr. Paul Rithaler
Title:	Senior Project Officer
Telephone No.	604-814-1066
Email address:	Paul.Rithaler@pwgsc-tpsgc.gc.ca
Other Authority(ies)	Public Works and Government Services Canada (Contracting Agency and Contract Management) – Joanne Levesque (Joanne.Levesque2@csc-scc.gc.ca)

B. Background

i. Project Description

The Mission Medium Institution Perimeter Road Repaving Works Project (the 'project') will be completed in the northern, western and southern portions of the perimeter and consist of mainly of repaving. The bulk of the intrusive construction works are to be undertaken in the eastern portion of the facility (Figure 1). Engineering design drawings are presented in Appendix A:

- The reconstruction of storm drainage crossings below the east portion of the perimeter road;
- Restoration, reconstruction and overlay of existing pavement along the entire perimeter road;
- Vertical and horizontally realigning of the eastern portion of the perimeter road and adjacent storm drainage ditch; and
- Complete tie-ins, miscellaneous removals and repairs, curb replacements and extensions and restoration of pavement markings.

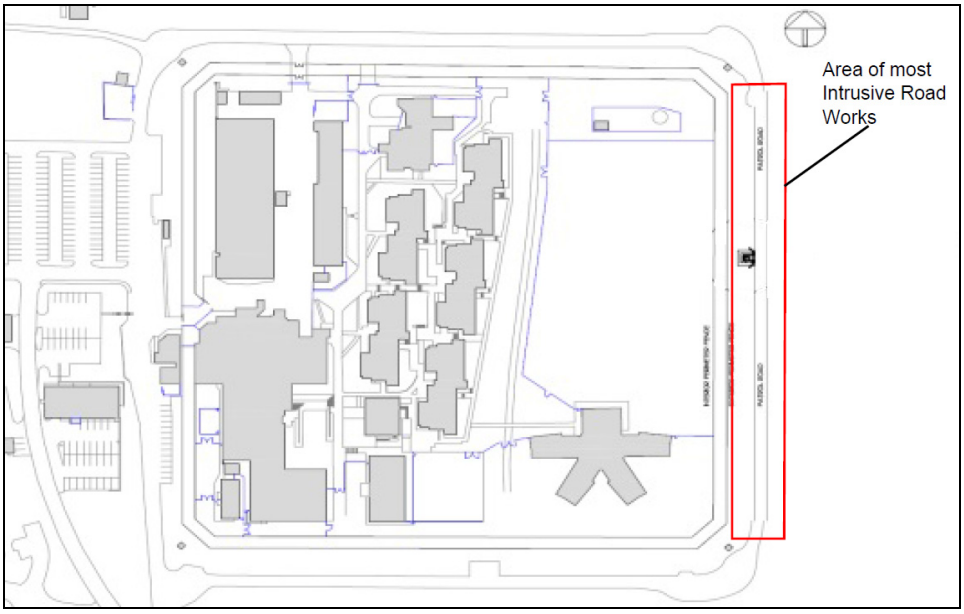

Figure 1: Proposed Perimeter Road Works in 2018

A detailed review of available information about the project indicates that the works are to commence immediately upon official notification of acceptance of offer and they are to be complete by March 31, 2018. Details of the contractor's works are specified in Public Works and Government Services document "SPECIFICATIONS for MISSION INSTITUTION, MEDIUM -PERIMETER ROAD UPGRADES MISSION, B.C. Project No. R. 065485.001 October 2017."

ii. Description of the Environment

Works to be completed in the northern, western and southern portions of the perimeter and consist of mainly of repaving. The bulk of the intrusive construction works are to be undertaken in the eastern portion of the facility. The Site is currently occupied by mixed native and non-native grasses / forbs and a drainage ditch is located in the west (Photographs 1, 2, and 3). There is a channelized watercourse and marsh complex east of the proposed works, with connectivity (via culverts) to the drainage ditch (Photograph 4 and 5). This ditch is shallowest to the north, becoming increasingly deeper and wider in the south. Four (4) wetted width measurements of the ditch were taken systematic along its length. The ditch was shown to have an average width of 2.2 m and a maximum depth of 0.85 m. Keystone Environmental Ltd. (Keystone Environmental) completed a bio-inventory in February 2016. Species observations were also made during salvages and monitoring visits during the guard tower construction during February to September 2017. The visits documented the presence of northwestern salamander (*Ambystoma gracile*) egg masses, larva, and adult salamanders in the ditch (Photograph 5 and 6), east of the proposed perimeter road footprint. An unconfirmed fish species, possibly a three-spined stickleback (*Gasterosteus aculeatus*), was also observed in the ditch. Three (3) culverts connect the ditch to the channelized watercourse and wetland complex in the east (Photograph 5). The culverts are located in the vicinity of two guard towers (i.e., Guard Towers 3 and 4) south of the newly constructed guard tower. The ditch is ephemeral and when wet the culverts allow for movement of aquatic life between the ditch and the channelized watercourse. During periods when the water table is high, amphibians are able to cross the road between the ditch and the watercourse.

The ditch and road edge are regularly mowed. As a result, vegetation in the ditch was limited to grasses and weeds (Photographs 3, 12, and 13). The bio-inventory completed February 2016 identified various plants including: reed canarygrass (*Phalaris arundinacea*), common rush (*Juncus effusus*), common cattail (*Typha latifolia*) and mixed weeds (e.g., red clover [*Trifolium pratense*] and creeping buttercup [*Ranunculus repens*]).

The riparian community of the eastern channelized watercourse and wetland contain red alder (*Alnus rubra*), paper birch (*Betula papyrifera*), hardhack (*Spiraea douglasii*), trailing blackberry (*Rubus ursinus*), isolated pockets of invasive Himalayan blackberry (*Rubus armeniacus*) and reed canarygrass. During the February 2016 assessment, several northwestern salamander egg masses were observed in the channelized watercourse (Photograph 9). Additionally, two egg masses of the provincially blue-listed and federally ranked species of 'Special Concern' (listed under Schedule 1 of the *Species at Risk Act*), red-legged frog (*Rana aurora*) were also observed. These findings are

similar to field results observed in 2005 by Keystone Environmental as part of a *Canadian Environmental Assessment Act* (CEAA) screening document associated with a land clearing and fencing project in the north and east of the institution. During that assessment, fish sampling in the channelized watercourse confirmed the presence of northwestern salamander and cutthroat trout (*Oncorhynchus clarkii clarkii*). Other species-at-risk confirmed at the Mission Institution during Keystone Environmental species-at-risk inventories in 2006 and 2007 included Great Blue Heron (*Ardea herodias* ssp. *fanni*ni), Barn Owl (*Tyto alba*), and a Barn Swallow (*Hirundo rustica*) nest identified on a guard tower. Another potentially occurring species-at-risk that may utilize the project area and surrounding habitats is the BC provincially Red-listed snowshoe hare (*Lepus americanus washingtonii*)[1].

Photographs of the Site were taken by Keystone Environmental during the February 2016 field visit, and during construction monitoring visits from February through September 2017 for the guard tower construction project. These photographs are provided in Appendix A.

C. Consultation and Engagement

This section identifies sources that were consulted with and/or engaged regarding the project's potential to cause adverse environmental effects. These include listing activities/issues around:

Potential Source of Concern	Description of Concerns
Is there public concern accompanying this project? ☐ **Yes** ☑ **No**	Discussed in the following sections.
Was the public consulted? ☐ **Yes** ☑ **No**	Discussed in the following sections.
Were Aboriginal Peoples engaged? ☐ **Yes** ☑ **No**	Discussed in the following sections.
Were other experts/ jurisdictions consulted? ☑ **Yes** ☐ **No**	Keystone Environmental conducted an assessment of the project area on 26 February 2016 and was tasked with authoring an EEE to ensure that potential impacts to aquatic habitats and potentially occurring and confirmed species-at-risk are appropriately mitigated.
How have you addressed the concerns that were raised?	Discussed in the following sections.

i. Public Concern

Based on the fact that the project will be carried out within active areas of the Institution that are not readily accessible by the general public, this project is not anticipated to generate public concern.

[1] Observed by Ms. Joanne Lévesque Institutional Environmental Officer (Mission Complex and WHI Institutions), Environmental Protection Programs Correctional Service Canada / Government of Canada.

ii. Public Consultation

Public consultation is not deemed to be required as the work will be restricted to the active areas of the Institution.

iii. Aboriginal Engagement

This project is not expected to adversely impact Aboriginal Rights and Traditional Uses since it is on the Institution land.

iv. Expert Consultation

An initial Site visit to collect biophysical data for the Mission Guard Tower replacement was collected on February 26, 2016. This information was used to assess potential aquatic and terrestrial impacts associated with the proposed perimeter road repaving works. The observations, potential impacts and proposed mitigation measures are discussed in the subsequent sections of this EEE document.

D. Identifying Environmental Effects

The following tables were completed in order to identify the relevant potential adverse environmental effects. Answers of "Yes, and can be managed through Effective and Established Mitigation Measures" are addressed in Section E. Answers of "Yes, but must be managed through other mitigation measures" are addressed in Section F.

Biophysical effects:	NO	Yes, and can be managed through Effective and Established Mitigation Measures	Yes, but must be managed through other mitigation measures
Is the project located on:			
A site containing vulnerable natural features (e.g. habitat for endangered species, water source for a town, wetlands, etc.)?	☐	☑	☐
Does the project have the potential to:			
Release a polluting substance into the land, water, or air?	☐	☑	☐
Cause land use changes (e.g. resource extraction, deforestation, clearing of vegetation, etc.)?	☑	☐	☐
Affect species at risk (flora or fauna) in or adjacent to the proposed project area?	☐	☑	☐
Result in alteration of water level, quality, flow or management regime in a water body, or result in other important changes to surface or groundwater resources (including well-water)?	☐	☑	☐
Cause noise and/or vibrations?	☐	☑	☐
Cause any other change to the environment on federal lands or incidental to a federal decision?	☑	☐	☐
Socio-economic effects (Aboriginal Peoples):	NO	Yes, and can be managed through Effective and Established Mitigation Measures	Yes, but must be managed through other mitigation measures
Does the project have the potential to impact aboriginal peoples based on a change to the environment in relation to:			
Health and Socio-economic conditions	☑	☐	☐
Physical and cultural heritage	☑	☐	☐
The current use of lands and resources for traditional purposes	☑	☐	☐
Any structure site or thing that is of historical, archaeological, paleontological or architectural significance.	☑	☐	☐

Socio-economic effects (general):	NO	Yes, and can be managed through Effective and Established Mitigation Measures	Yes, but must be managed through other mitigation measures
Does the project have the potential to cause a change in the environment resulting from a related federal decision (power, duty or function) that may result in impacts to:			
Health and Socio-economic conditions	☑	☐	☐
Physical and cultural heritage	☑	☐	☐
Any structure site or thing that is of historical, archaeological, paleontological or architectural significance.	☑	☐	☐

E. Established and Effective Mitigation Measures

In accordance with the CEAA document "Making a determination under section 67 of the *Canadian Environmental Assessment Act*, 2012, December 2014" mitigation measures are considered "effective and established" if they meet all of the following criteria:

- Have been implemented before in similar situations;
- Are well understood and considered reliable; and
- Are 'Avoid' or 'Reduce' type mitigation measures.

https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=6E01A733-1&offset=4&toc=hide

This section involves describing any potential environmental effects associated with the project identified in Section D, establishing if they're biophysical (B.P.), socio-economic (S.E.) or both, and defining the corresponding "effective and established" mitigation measure which will be used to manage the environmental effect.

Environmental Effect	B.P.	S.E.	Effective and Established Mitigation Measure
Impact to Species at Risk	☑	☐	Refer to Appendix B "Summary of Confirmed Species at Risk at Mission Medium Institution and Mitigation of Potential Impacts" for mitigation measures related to Species at Risk.
Impact to Wildlife	☑	☐	Contingent on construction methodology, de-watering and culvert replacements are required for culverts at locations 0+580 and at 0+790 (Appendix A). In addition, the headwall at 0+690 is to be relocated and re-tied into the existing culvert. Appropriate salvages are to be undertaken following the receipt of appropriate salvage permits. The contractor will be responsible for retaining a qualified environmental professional (QEP) to conduct the salvages based on their construction methodology. If the work is done during the bird breeding season the contractor cannot disturb active songbird nests in the area.
Impact to nesting birds	☑	☐	If the work is done during the bird breeding season the contractor will be required to protect nesting birds by only clearing vegetation for worksite access and construction during Regional Timing Windows. The typical peak nesting window for the Lower Mainland area is March 30 – August 15 of any year for the habitat and area.
Sediment from construction impacting fish and fish habitat	☑	☐	The contractor will be responsible for implementing the following mitigation measures: • Establish and submit to the CSC Environmental Officer a sediment and erosion control plan prior to work on-site which will: 1) Effectively isolate the active work areas for culvert and headwall replacements and prevent deleterious substances from the road works to affect the associated watercourse;

Environmental Effect	B.P.	S.E.	Effective and Established Mitigation Measure
			2) A dewatering strategy, if required; 3) Manage turbid run-off water, including diverting run-off around the active work site; and 4) Be protective of aquatic habitats. • Have additional sediment control materials readily available in case they are needed promptly for erosion and sediment control. • Re-vegetate or otherwise stabilize any loose soils after construction works to prevent erosion and transport (e.g., hydraulic seeding or erosion blanket seeded with native non-invasive species). • If concrete pouring activities during construction are necessary, ensure that the pH of any discharge water is within acceptable limits (pH 6.5 – 9.0). • Control disposal and/or runoff of water containing suspended materials or other harmful substances in accordance with regulatory requirements as listed in the Sediment and Erosion Control Plan. • Store any stock piles of soil or fill material at least thirty metres from water bodies, and protect them with sediment barrier. • Re-fueling and maintenance of vehicles and equipment to be carried out at pre-designated locations away from any water bodies. • Operate and store materials and equipment in a manner that prevents deleterious substances from entering water. Water discharged may be tested by the CSC Environmental Officer. The performance standard for water being discharged to receiving water bodies are the values for Aquatic life (fresh, marine, estuarine) found in "Table 1: Summary of water quality guidelines for turbidity, suspended and benthic sediments": http://www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbidity.html#tab1 The contractor will be responsible for compliance with all of DFO's Land Development Guidelines for the Protection of Aquatic Habitat (2.79MB PDF), MOE's Develop with Care and MOE's General BMPs and Standard Project Considerations and any permits required. www.dfo-mpo.gc.ca/Library/165353.pdf http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/index.html http://www.env.gov.bc.ca/wld/instreamworks/generalBMPs.htm Comply with: • Section 6 ENVIRONMENTAL PROCEDURES • Section 15 CLEANING; and • Section 16 CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL As outlined in Public Works and Government Services document "SPECIFICATIONS for MISSION INSTITUTION, MEDIUM -PERIMETER ROAD UPGRADES MISSION, B.C. Project No. R. 065485.001 October 2017."
Accidents Related to Storage and Transportation of Dangerous Goods	☑	☐	The contractor will be responsible for the following mitigation measures: • Transportation of hazardous material must be in accordance with the *Transportation of Dangerous Goods Act*, by a licensed hauler and in approved containers. • Store incompatible materials separated to prevent reaction.

Environmental Effect	B.P.	S.E.	Effective and Established Mitigation Measure
Air Emissions and Dust	☑	☐	The contractor will be responsible for the following mitigation measures: • Prevent material from operations that may contaminate air beyond application area, by using wetting techniques or providing temporary enclosures. • Use new or well-maintained heavy equipment and machinery, preferably fitted with muffler/exhaust system baffles, and engine covers. • Comply with operating specifications for heavy equipment and machinery. • Minimize the operation and idling of vehicles, and avoid operating and idling vehicles and gas-powered equipment during smog advisories. • Control emissions from equipment to conform to federal, provincial, and municipal requirements.

Potential Spills from Heavy Equipment	☑	☐	The contractor will be responsible for the following mitigation measures:
			• Establish and submit a spill response plan.
			• Store all petroleum, oil, lubricants, and other hazardous materials within secondary containment, or in an appropriate metal clad storage building with containment.
			• With respect to liquid spills, provide enough on-site equipment to control for one hour a liquid spill of 100% of any material brought on to—or handled at—the site.
			• The minimum typical on-site spill response equipment required to include spill kit in on-site vehicles and machinery, absorbent pads, absorbent granular, garbage bags and shovels.
			• In the event of a spill, invoke Contractor's spill response plan and notify the CSC Environmental Officer.
			• Emergency response planning is to include measures to escalate the response in the event of an emergency that exceeds on-site equipment capabilities
			• Prior to starting work, provide to the CSC Representative an inventory of hazardous material to be brought to the site, including volume or mass, and Material Safety Data Sheets (MSDS).
			• Ensure that equipment and machinery are in good operating condition, clean (power washed), free of leaks, excess oil, and grease. Do not refuel or service equipment within 30 m of any watercourse or surface water drainage.
			• Keep a Spill Containment Kit readily accessible on-site in the event of a release of a deleterious substance to the environment and ensure on-site staff are trained in spill response. Immediately report any spill of a substance of reportable quantities that is toxic, polluting, or deleterious to aquatic life to the Provincial Emergency Program Environmental Emergency Management Plan Incident Reporting Hotline 1-800-663-3456 and DFO's Observe, Record and Report Hotline 1-800-465-4336
			• As outlined in Public Works and Government Services document "SPECIFICATIONS for MISSION INSTITUTION, MEDIUM -PERIMETER ROAD UPGRADES MISSION, B.C. Project No. R. 065485.001 October 2017" Comply with:
			  • Section 6 ENVIRONMENTAL PROCEDURES;
			  • Section 15 CLEANING; and
			  • Section 16 CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL.

F. Other Mitigation Measures

This project does not involve mitigation measures which do not meet the definition of "effective and established".

G. Determination

Based on the contents of this report, it was determined that the project **is not likely to cause significant adverse environmental effects**.

Taking into account implementation of mitigation measures outlined in the analysis, this project is:

☑	**Not likely to cause significant adverse environmental effects**
☐	**Likely to cause significant adverse environmental effects**

H. Closure

This report has been prepared and reviewed by Keystone Environmental Ltd. approved personnel who have the credentials and knowledge of the applicable public laws, regulations and/or policies which apply to this report.

This report has been prepared solely for the internal use of and Public Services and Procurement Canada pursuant to the agreement between Keystone Environmental Ltd. and Public Services and Procurement Canada. By using this report Public Services and Procurement Canada agrees that they will review and use the report in its entirety. Any use which other parties make of this report, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this report.

We trust this report provides the information you require. Should you require clarification, please do not hesitate to contact the undersigned at 604-430-0671.

Sincerely,

Keystone Environmental Ltd.

Libor Michalak R.P.Bio., P.Biol.
Senior Biologist

Jamie Slogan, Ph.D., R.P.Bio.
Department Head, Biological Services

Appendix A – Project Design Drawings

DESIGN	LEGEND	EXISTING
	EDGE OF PAVEMENT	
S F L G C	S – SEWER, W – WATER, D – DRAIN, T – TEL. F – FIRELINE, PHWS – HEATING WATER SUPPLY L – LIGHTING, PHWR – HEATING WATER RETURN G – GAS, H/T – HYDRO/TEL C – COMMUNICATIONS	S F L G C
DMH #1	DMH – STORM MANHOLE, SMH – SAN. MANHOLE	DMH
CB #1	CATCH BASIN – CB	CB
LB #1	LAWN BASIN – LB	LB
10.55	SPOT ELEVATION	+10.00
	FENCE LINE	
	FIRE HYDRANT	
	WATER VALVE	
	GROUNDWATER MONITORING STANDPIPE	
	AREA TO BE REPAIRED, PAVING REQUIRED	
	AREA TO BE REPAIRED, NO PAVING REQUIRED	
	CRACKS TO BE REPAIRED	

Stations up to 0+567.24m and stations above 0+817.82m: 35mm asphalt overlay

Repairs to and widening of existing pavement are identified on plan view. For clarity, asphalt overlay and pavement raising areas are not shaded on plan view. Refer to profile, cross section and typical section views for asphalt overlay and pavement raising requirements.

PROPOSED ROAD PROFILE

EXISTING ROAD PROFILE

-1.07% 0.30% 0.10% -0.09% 0.11% -0.29% -0.37% 0.97%

0+567.24	0+597.54	0+616.07	0+662.98	0+693.73	0+722.90	0+756.82	0+788.13	0+817.82
133.10	132.78	132.83	132.88	132.85	132.89	132.79	132.67	132.96

.72	134.15	133.36	132.58	132.49	132.56	132.61	132.64	132.62	132.63	132.62	132.60	132.59	132.51	132.69	132.95	133.13	133
520	0+540	0+560	0+580	0+600	0+620	0+640	0+660	0+680	0+700	0+720	0+740	0+760	0+780	0+800	0+820	0+840	0+8

Replace existing culvert as per existing diameter and elevations, extend west to proposed realigned ditch and add Langley Concrete Type 2 or equivalent approved to both ends.

0+570 0+580 0+590 0+600 0+610 0+620 0+630 0+640 0+650 0+660 0+670 0+680 0+690 0+700 0+710 0+720 0+730 0+740 0+750 0+760 0+770 0+780 0+790 0+800 0+810

0+560 0+820

ROAD TO BE RELOCATED TO THE WEST TO AVOID DISRUPTION OF THE ENVIRONMENTALLY SENSITIVE AREA TO THE EAST.

Ex. HEADWALL TO BE RELOCATED AND RE-TIED INTO EXISTING CULVERT.

MATCH TO EXISTING PRIOR TO OVERLAY OF PERIMETER ROAD. SEE DETAIL SHEET 01.

Replace existing culvert as per existing diameter and elevations, extend west to proposed realigned ditch and add Langley Concrete Type 2 or equivalent approved to both ends.

DITCH TO BE SHIFTED TO THE WEST TO ACCOMMODATE ROAD RELOCATION.

Ex. OUTFALL TO BE RELOCATED TO SUIT NEW DITCH.

MATCH TO EXISTING PRIOR TO OVERLAY OF PERIMETER ROAD. SEE DETAIL SHEET 01.

SCALE 1:500

0 10 20 30 40 50 60 70 80 90 100mm

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Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique

WEDLER ENGINEERING

CONSULTANT PROJECT No.: C16-5312/A

Revision/ Revision	Description/Description	Date/Date
0	ISSUED FOR REVIEW	2017/08/17

Client/client

CORRECTIONAL SERVICES CANADA

Project title/Titre du projet

8751 STAVE LAKE STREET
MISSION, B.C.

MISSION MEDIUM INSTITUTION

Consultant Signature Only
WEDLER ENGINEERING LLP.

Designed by/Concept par
FID/ADV

Drawn by/Dessine par
ADV

PWGSC Project Manager/Administrateur de Projets TPSGC
DARYL SINCLAIR

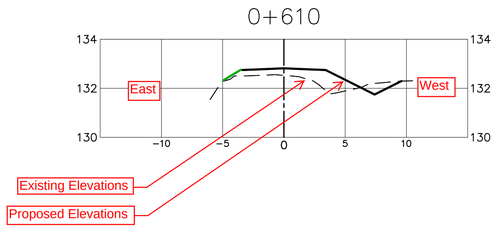
Regional Manager, Architectural and Engineering Services
Gestionnaire régionale, Services d'architectural et de génie, TPSGC

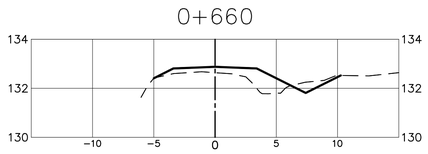
Drawing title/Titre du dessin

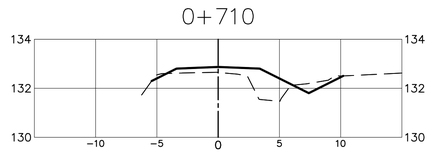
ROADWORKS EAST
PERIMETER ROAD

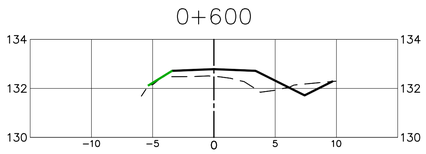
Project No./No. du projet	Sheet/ Feuille	Revision no./ La Révision no.
R.079746.001	2	

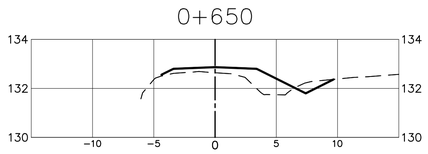
ALL SECTIONS ARE VIEWED IN THE DIRECTION OF STATION INCREASE.
ALONG THE EAST SIDE OF THE PERIMETER ROAD THE DIRECTION OF STATION INCREASE IS NORTH TO SOUTH.

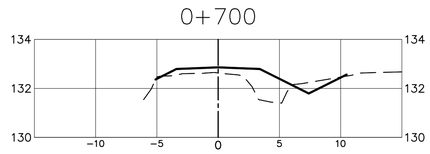


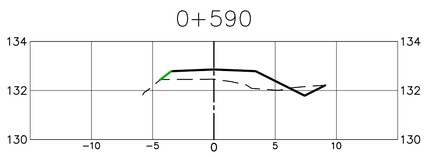


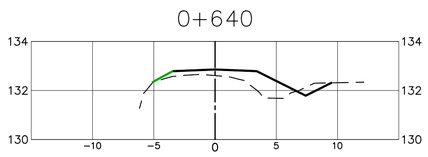


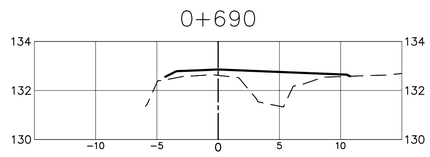


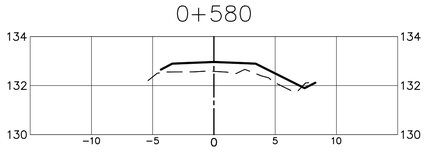


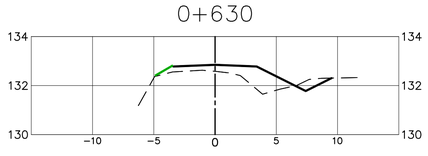


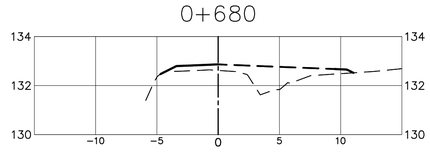


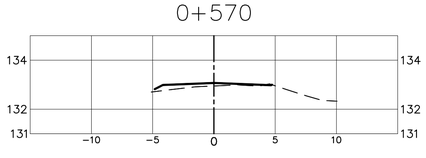


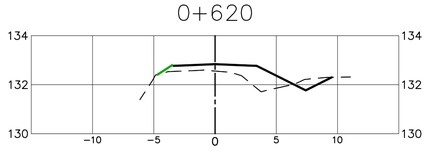


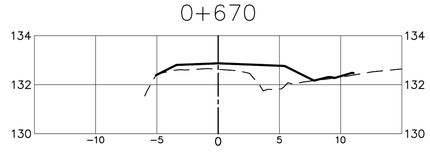












H SCALE 1:250
V SCALE 1:125

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Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique

WEDLER ENGINEERING

CONSULTANT PROJECT No.: C16-5312/A

Revision/ Revision	Description/Description	Date/Date
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CORRECTIONAL SERVICES CANADA

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Consultant Signature Only
WEDLER ENGINEERING LLP.

Designed by/Concept par
FID/ADV

Drawn by/Dessine par
ADV

PWGSC Project Manager/Administrateur de Projets TPSGC
DARYL SINCLAIR

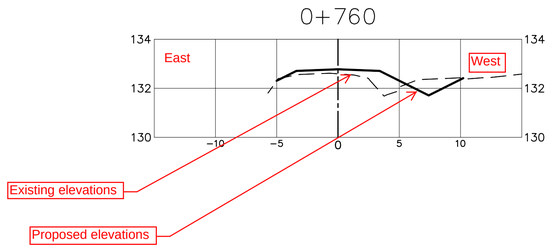
Regional Manager, Architectural and Engineering Services
Gestionnaire régionale, Services d'architectural et de génie, TPSGC

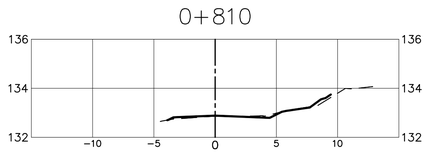
Drawing title/Titre du dessin

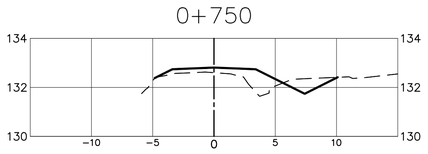
SECTIONS
STA. 0+570 TO 0+710
PERIMETER ROAD

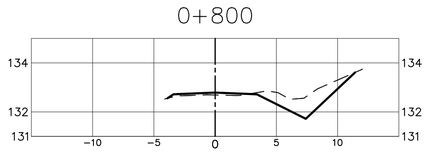
Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.079746.001	**6**	

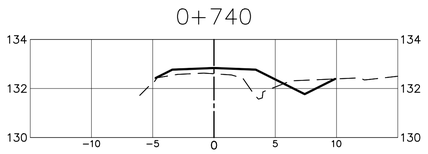
ALL SECTIONS ARE VIEWED IN THE DIRECTION OF STATION INCREASE.
ALONG THE EAST SIDE OF THE PERIMETER ROAD THE DIRECTION OF STATION INCREASE IS NORTH TO SOUTH.

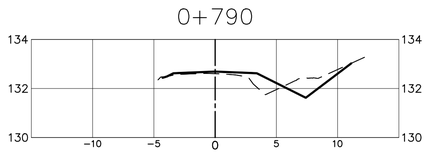


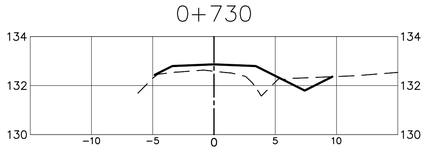


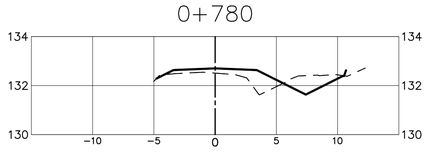


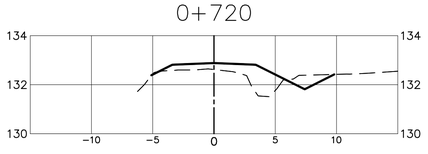


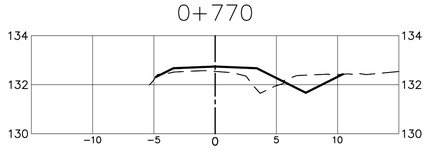












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Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique

WEDLER ENGINEERING

CONSULTANT PROJECT No.: C16-5312/A

Revision/ Revision	Description/Description	Date/Date
0	ISSUED FOR REVIEW	2017/08/17

Client/client

CORRECTIONAL SERVICES CANADA

Project title/Titre du projet

8751 STAVE LAKE STREET
MISSION, B.C.

MISSION MEDIUM INSTITUTION

Consultant Signature Only
WEDLER ENGINEERING LLP.

Designed by/Concept par
FID/ADV

Drawn by/Dessine par
ADV

PWGSC Project Manager/Administrateur de Projets TPSGC
DARYL SINCLAIR

Regional Manager, Architectural and Engineering Services
Gestionnaire régionale, Services d'architectural et de génie, TPSGC

Drawing title/Titre du dessin

SECTIONS
STA. 0+720 TO 0+810
PERIMETER ROAD

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.079746.001	**7**	

Appendix B – Assessment Photographs

Photograph 1: Looking south of the ephemeral ditch located adjacent and west of the proposed road works (September 7, 2017).

Photograph 2: Looking north at the ephemeral ditch located adjacent and west of the proposed road works (September 7, 2017).

Photograph 3: Typical vegetation assemblage in ditch located west of the proposed road works (February 26, 2016).

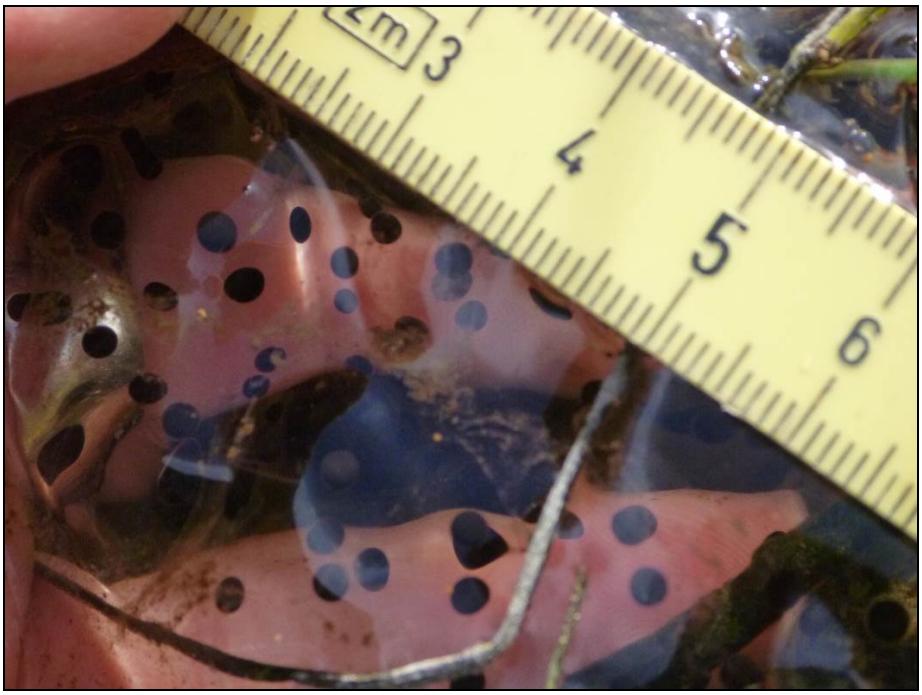
Photograph 4: Looking north at the location of proposed road works (September 7, 2017).

Photograph 5: Looking southeast at the channelized watercourse and wetland east of the proposed road works (April 13, 2017).

Photograph 6: Looking northeast of the culvert located at 0+580 in the ditch to be replaced during the proposed road works (September 7, 2017).

Photograph 7: Looking north at the channelized watercourse and wetland areas east of the guard road (February 26, 2016).

Photograph 8: Looking east at the wetland area, east of the road (May 25, 2017).



Photograph 9: Northwestern Salamander egg mass found in ditch west of proposed road works (February 26, 2016).

Photograph 10: Northwestern Salamanders salvaged from the ditch west of proposed road works (February 3, 2016).

Photograph 11: Looking northeast at the headwall located at 0+690 in the ditch to be relocated and re-tied into the existing culvert during the proposed road works (July 11, 2017).

Photograph 12: Mineral substrate and algae growth around submerged ditch grasses (February 26, 2016).

Photograph 13: Looking northeast at the headwall located in the ditch at 0+690 to be relocated and re-tied into the existing culvert during the proposed road works (July 11, 2017).

Appendix C – Species at Risk Potential Occurrence Details

Appendix B: Summary of Confirmed Species at Risk at Mission Medium Institution and Mitigation of Potential Impacts

Species	Latin Name	Ranking Federal/Provincial	Brief Habitat Description	Potential Project Impact	Mitigation Measure	Residual Effects
Mammals						
Pacific water shrew	*Sorex bendirii*	Endangered (SARA Schedule 1) / Red	Ditch	Potential impact associated with road works and habitat destruction infilling and/or construction around channelized watercourse.	The wetted areas adjacent to the road works should be isolated with silt fencing to prevent wildlife from entering the active work area. If Pacific Water Shrew are seen in the ditch area after isolation (unlikely as they prefer habitat with large woody debris and dense vegetation), a QEP should conduct a salvage consistent with *Best Management Practices Guidelines for Pacific Water Shrew in Urban and Rural Areas* (BC Ministry of Environment [MOE], 2010), under the direction of the CSC Environmental Officer prior to the onset of works.	None
Townsend's big-eared bat	*Corynorhinus townsendii*	Not listed Federally/Blue	Occupy a broad range of habitats	None Anticipated	None required	None
Birds						
Barn Owl	*Tyto alba*	Special Concern (SARA Schedule 1) / Red	Open field / pasture	None Anticipated	None required	None
Band-tailed Pigeon	*Patagioenas fasciata*	Special Concern (SARA Schedule 1) / Blue	Old field habitat / coniferous and deciduous forest habitat	None Anticipated	None required	None
Green Heron	*Butorides virescens*	Not federally listed / Blue	Urban, lake, meadow, stream, wetland and marsh habitats	Minor disturbance potential given proximity to wetland area for foraging.	Undertake appropriate monitoring and daily wildlife checks prior to the onset of works.	None
Peregrine Falcon	*Falco peregrinus anatum*	Special Concern (SARA Schedule 1) / Red	Caves, rock cliffs, wetlands, riparian and grassland habitats	None Anticipated	None required	None
Short-eared Owl	*Asio flammeus*	Special Concern (SARA Schedule 1) / Blue	Agricultural areas, grassland/shrub dominated meadows, and riparian and wetland areas	None Anticipated	None required	None

Appendix B: Summary of Confirmed Species at Risk at Mission Medium Institution and Mitigation of Potential Impacts

Species	Latin Name	Ranking Federal/Provincial	Brief Habitat Description	Potential Project Impact	Mitigation Measure	Residual Effects
Barn Swallow	*Hirundo rustica*	Threatened (SARA Schedule 1) / Blue	Old nests located on the existing guard tower	None	None Required	None
Western Screech-owl	*Megascops kennicottii ssp. Kennicottii*	Special Concern (SARA Schedule 1) / Blue	Mature coniferous or mature mixed forest habitat	None	None required	None
Great Blue Heron (fannini ssp.)	*Ardea herodias ssp. Fannini*	Special Concern (SARA Schedule 3) / Blue	Riparian habitat areas capable of supporting fish	Minor disturbance potential given proximity to channelized watercourse and wetland area for foraging.	Undertake appropriate monitoring and daily wildlife checks prior to the onset of works.	None
Migratory Birds All Other		Migratory birds are protected under Canada's *Migratory Birds Convention Act*, 1994		None expected as the works are to occur outside the bird breeding window and be complete before March 31, 2018 as stated in the "SPECIFICATIONS for MISSION INSTITUTION, MEDIUM - PERIMETER ROAD UPGRADES MISSION, B.C. Project No. R. 065485.001."	None required as the works are to occur outside the bird breeding window of March 30-Aug. 2018.	None
Northern red-legged frog	*Rana aurora*	Special Concern (SARA Schedule 1) / Blue	Egg masses confirmed within the channelized watercourse / wetland complex.	Minor disturbance from road construction. Potential, given proximity to channelized watercourse and wetland area. Potential to directly impact juveniles and/or adults in the absence of appropriate mitigation.	Construction and laydown areas shall be specified to avoid impacting frog habitat. Undertake appropriate monitoring and daily wildlife checks prior to the onset of works. Isolate road works from watercourse areas via fencing to restrict aquatic life access. A QEP should conduct appropriate monitoring consistent with *Best Management Practices for Amphibian and Reptile Salvages in British Columbia* (BC MOE 2016) and *Interim Hygiene Protocols for Amphibian Field Staff and Researchers* (BC MOE 2008) and contingent on construction methodology, under the direction of the CSC Environmental Officer prior to the onset of works..	None
Western toad	*Anaxyrus boreas*	Special Concern (SARA Schedule 1) / Blue	Forested and aquatic habitats	None Anticipated	None required	None

Appendix B: Summary of Confirmed Species at Risk at Mission Medium Institution and Mitigation of Potential Impacts

Species	Latin Name	Ranking Federal/Provincial	Brief Habitat Description	Potential Project Impact	Mitigation Measure	Residual Effects
Fish						
Cutthroat trout	*Oncorhynchus clarkii clarkii*	Not federally listed / Blue	Confirmed in channelized watercourse / wetland area adjacent to the project area	Sediment from construction site has the potential to flow into the ditch and channelized watercourse and directly /indirectly impact fish.	Sediment and erosion control measures will be required by the contractor to isolate the works area from the watercourses. A QEP should conduct appropriate salvages (e.g. minnow trapping, seine nets, electrofishing), contingent on construction methodology/impact to fish-bearing waters, and under the direction of the CSC Environmental Officer.	None
Invertebrates						
Monarch butterfly	*Sympetrum vicinum*	Special Concern (SARA Schedule 1) / Blue	Agricultural areas, suburban areas and grassland / shrub / meadow habitats.	None	None required	None
Oregon forestsnail	*Allogona townsendiana*	Endangered (SARA Schedule 1) / Red	Forested areas dominated by Bigleaf Maple and Stinging Nettle. Occasionally present where Stinging Nettle is present in open field habitat.	None	None required	None

http://speciesatriskbc.ca/
http://a100.gov.bc.ca/pub/eswp/
http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#second_