Drawing Number	Drawing Title
Civil	
C1	Existing Conditions and Topographic Survey Plan
C2	Site Servicing Plan
C3	Parking Lot Grading and Reinstatement Plan
C4	Details I
C5	Details II
C6	Details III
C7	Details IV
Demolition	
D1	Excavation and Selected Site Demolition Plan
Landscaping	
L100	Vegetation Removal and Preservation Plan
L200	Landscape Reinstatement Plan
L300	Landscape Details
Structural	
S01	Sign Post Details

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract apply to this Section.

1.2 TAXES

.1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

1.3 FEES, PERMITS and CERTIFICATES

.1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Contract Documents.

1.4 DEFINITIONS

.1 Departmental Representative: Within the context of these Specifications, the term Departmental Representative refers to a Public Service and Procurement Canada representative exercising the roles and attributes of Canada under the contract.

.2 Contractor: Principal Contractor as defined by the Contract Documents, retained to undertake the Work as defined within the context of these specifications.

.3 The word “provide” means supply and install, operate, submit or any other procedure necessary to complete the work as intended.

.4 Sub-contractor: A contractor under contract to Principal Contractor and subject to the same contract requirements as the Principal Contractor. Co-ordinates 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 Work.

.5 Work related to this contract document comprises the excavation and disposal of non-hazardous CCME Contaminated Soil and reinstatement of the Site including but not limited to:

- .1 Health and safety
- .2 Environmental protection, and
- .3 Excavation of non-hazardous CCME Contaminated Soil as described in subsequent Sections of this specification.
- .4 Reinstatement of the Site as described in subsequent Sections of this specification.

.6 Site: Areas affected by excavation and reinstatement activities, as illustrated on Drawings provided with this specification, located at 555 Booth Street, Ottawa, Ontario.

.7 Hazardous Materials: product, substance, or organism that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

1.5 CONSTRUCTION PROGRESS SCHEDULE

.1 Schedule and execute work using a phased approach as to limit the extent of open excavation and interference or disturbance to the normal use of premises and as follows:

.1 The main building entrance located on Booth St. is to remain accessible and operational at all times throughout the project.

.2 The heating plant equipment located near the northeast corner of Booth St. and Daniel McCann St. remain accessible and operational at all times throughout the project.

.3 A minimum of two emergency exits, one on each building wing, remain accessible and operational at all times throughout the project.

.4 Argon tank, associated piping, and concrete pad to be protected and remain in service throughout the project.

.5 Parking facilities to remain accessible to building occupants, as much as possible, throughout the project.

.2 On award of contract submit work plans including bar chart construction schedule, for each work phase, indicating anticipated progress stages within time of completion. When the Departmental Representative has reviewed each work plan, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.

.3 Carry out work during "regular hours", Monday to Friday from 07:00 to 18:00 hours.

.4 Contractor to give the Departmental Representative 48 hours notice for work to be carried out on Saturdays, Sundays, and statutory holidays, including the extent of work and proposed resource assignment.

1.6 SUBMITTAL PROCEDURES

.1 Submittals: In accordance with Section 01 33 00 – Submittal Procedures

.2 Submit promptly to Departmental Representative submittals listed for review, in orderly sequence to not cause delay in Work. A complete list of required Contractor submittals is provided at the end of Section 01 33 00 – Submittal Procedures.

.3 Samples:

.1 Submit samples: In accordance with Section 01 33 00. Examples of materials, equipment, quality, finishes and workmanship.

.2 Where colour, pattern or texture is criterion, submit full range of samples.

.3 Reviewed and accepted samples will become standard of material and workmanship, against which installed work will be verified.

.4 Closeout Submittals as indicated in item 1.16 of this Section.

1.7 REGULATORY REQUIREMENTS

.1 References and Codes:

.1 Materials shall be new and work shall conform to the minimum applicable standards of the “References” indicated in the specification sections, the National

Building Code of Canada 2015 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.

.2 Building Smoking Environment:

.1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.

.2 Smoking is not permitted within 5 m of building air intakes or openable windows.

.3 Hazardous Material Discovery:

.1 Hazardous Materials in the form of storm and sanitary drains containing asbestos (illustrated on Drawing D1 – Excavation and Selected Site Demolition Plan) are to be removed as part of the Work. If additional Hazardous Materials are discovered stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould, asbestos, or other designated substance is encountered during demolition work.

.1 Take preventative measure and promptly notify Departmental Representative.

.2 Do not proceed until written instructions have been received from Departmental Representative.

.4 Federal Regulations:

.1 Canadian General Standards Board (CGSB):

.1 CGSB 51-GP-51M-81, Polyethylene Sheet for Use in Building Construction.

.2 Transportation and Dangerous Goods Act (1999).

.3 Canadian Environmental Protection Act (1999).

.4 Canadian Council of Ministers of the Environment (CCME) Documentation:

.1 Canadian Environmental Quality Guidelines (2017).

.5 Environment Canada's Best Practices for the Reduction of Air Emissions from Construction and Demolitions Activities.

.5 Provincial Regulations:

.1 Ontario Environmental Protection Act (RSO 1990);

.2 Ontario Water Resources Act (RSO 1990);

.3 Ontario Regulation 558/00 – Waste Management;

.4 Ontario Regulation 102/94 – Waste Audits and Waste Reduction Work Plans

.5 Ontario Regulation 103/94 – Industrial, Commercial and Institutional Source Separation Programs

.6 Municipal Regulations:

.1 City of Ottawa Sewer Use By-Law (2003-514)

1.8 FIRE SAFETY REQUIREMENTS

.1 Comply with both the National Building Code of Canada 2015 and the National Fire Code of Canada 2015 for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows;

.1 The National Building Code (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.

.2 The National Fire Code (NFC):

.1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.

.2 The conduct of activities that might cause fire hazards in and around buildings.

.3 Limitations on hazardous contents in and around buildings.

.4 The establishment of fire safety plans.

.5 Fire safety at construction and demolition sites.

.6 Allow free access to stand pipe access points for fire fighting or make other arrangements with written approval from the Departmental Representative.

.2 Welding and cutting:

.1 Before welding, soldering, grinding and/or cutting work, obtain a permit as directed by the Departmental Representative. Store flammable liquids in approved CSA containers.

.2 At least one week prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:

.1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.

.2 Completed welding permit as defined in NFC.

.3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.

.3 "Fire Watchers" as described in NFC shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 15m may be ignited by conduction or radiation.

1.9 QUALITY CONTROL

.1 Contractor:

.1 Provide Departmental Representative with applicable testing results to verify materials (e.g., asphalt, concrete, fill materials) to be used or applied at the Site are compliant with this specification.

.2 Departmental Representative to test Contractor provided materials and application of the materials during Work for quality assurance purposes:

.1 Confirm backfill material is considered Clean fill, as defined in Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

.2 Backfill materials and compaction results as defined in Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

.3 Concrete and asphalt specifications as defined in Sections 03 30 00 – Cast-in-Place Concrete and 32 12 16 – Asphalt Paving respectively.

.4 Wastewater generated during Work prior to discharge into municipal sewers.

.5 Efficiency of Contractor's Dust and Soil Tracking Control Plan, as discussed in Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

.3 Testing Laboratory Services:

.1 Contractor will appoint and pay for costs of any initial testing required to verify materials compliance with the specification.

.2 Departmental Representative will appoint and pay for costs of inspection and testing services of Contractors materials and their application for quality assurance purposes.

.3 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.

.4 Where tests indicate non-compliance with specifications, contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.10 HAZARDOUS MATERIALS

.1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS).

1.11 TEMPORARY UTILITIES

.1 Existing services required for work may not be used by the Contractor.

.2 Notify the Departmental Representative and utility companies of intended interruption of services and obtain requisite permission.

.3 Give the Departmental Representative 48 hours notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.

1.12 COMMON PRODUCT REQUIREMENTS

.1 Quality of Work:

.1 Carry out work using qualified licenced workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.

.2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licenced workers.

.3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.

.2 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.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove packaging or bundling until required in work.

.3 Manufacturer's Instructions: 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.

1.13 EXAMINATION and PREPARATION

.1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.

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

1.14 EXECUTION

.1 Cut, Patch and Make Good:

.1 Cut existing surfaces as required to accommodate new work.

.2 Remove all items so shown or specified.

.3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.

.2 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

1.15 WASTE MANAGEMENT

.1 Comply with Environmental Protection Act, Ontario Regulations: O. Reg. 102/94 – Waste Audits and Waste Reduction Work Plans; and O. Reg. 103/94 – Industrial, Commercial and Institutional Source Separation Programs; for waste management on construction and demolition projects.

.2 Conduct "waste audit" to determine what waste will be generated during construction and demolition operations. Prepare written "waste reduction work plan" and implement the principles to reduce, reuse and recycle materials to the extent that is possible.

.3 Provide a "source separation program" to disassemble and collect in an orderly fashion the following "materials designated for alternative disposal" from the "general waste" stream:

.1 brick and Portland cement concrete;

.2 cardboard (corrugated);

.3 gypsum board (unfinished);

.4 steel; and

.5 wood (not including painted, treated or laminated wood).

.4 Submit complete records of all removals from site for both "materials designated for alternative disposal" and "general waste" including:

.1 time and date of removal;

.2 description of material and quantities; and

.3 proof that materials have been received at an approved Waste Processing Site or certified Waste Disposal Site as required.

1.16 CLOSEOUT SUBMITTALS

.1 Records:

.1 Submit records to Departmental Representative:

.1 Planted vegetation maintenance records.

.2 Source of the following construction/work materials:

.1 Asphalt.

.2 Concrete.

.3 Clean backfill materials

.4 Paint and pavement markings

.3 Disposal records of all wastes generated during Work including quantities and disposal locations.

.2 As work progresses, maintain accurate records to show deviations from contract drawings. Just prior to Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative one (1) set of white prints with all deviations neatly inked in.

.3 Guarantees and Warranties:

.1 Before completion of work collect all manufacturer's guarantees or warranties and deposit with Departmental Representative.

1.17 CLEANING

.1 Clean up as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

.2 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.

.3 Clean areas under contract to a condition equal to what previously existed and to approval of Departmental Representative.

1.18 COST BREAKDOWN

.1 Before submitting first progress claim, submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating the Contract Amount. After approval by Departmental Representative cost breakdown will be used as the basis of progress payments.

1.19 PRECEDENCE

.1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Federal Legislation

- .1 Canada Labour Code, Part II, section 124 and 125. Canada Occupational Health and Safety Regulations
- .2 Transportation of Dangerous Goods Act, 1992 (TDGA)
- .3 Canada Consumer Product Safety Act
  - .1 Surface Coating Materials Regulations SOR/2005-109.
- .4 Canadian Environmental Protection Act, 1999 (CEPA)
  - .1 PCB Regulations (SOR/2008-273)
  - .2 Federal Halocarbon Regulations, 2003 (SOR/2003-289)

.2 Provincial Legislation

- .1 Ontario Occupational Health and Safety Act,R.S.O. 1990, 2010 edition.
  - .1 Ontario Regulation 490/09 – Designated Substances (O.Reg 490/09).
  - .2 Ontario Regulation 278/05 – Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations, (O.Reg 278/05).
  - .3 Ontario Regulation 213/91 for Construction Projects (O.Reg. 213/91)
- .2 Ontario Environmental Protection Act, R.R.O. 1990,
  - .1 Ontario Regulation 347/09, General – Waste Management (O.Reg 347/09).
  - .2 Ontario Regulations 362/90 – Waste Management, PCBs (O.Reg 362/90)
  - .3 Ontario Regulation 463/10, Ozone Depleting Substances and Other Halocarbons (O.Reg 463/10).
- .3 Canadian General Standards Board (CGSB).
- .4 Canadian Standards Association (CSA International), CAN/CSA-Z94.4-11 | Respiratory Protection
- .5 Underwriters' Laboratories of Canada (ULC).

1.2 DEFINITIONS

.1 Asbestos-Containing Materials (ACMs): means material that contains 0.5 per cent or more asbestos by dry weight as per Ontario Regulation 278/05.

.2 Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.3 HEPA vacuum: High Efficiency Particulate Arrestor filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.4 Time-weighted average exposure limit (TWAEL): the time-weighted average airborne concentration of a biological or chemical agent to which a worker may be exposed in a work day or work week as prescribed by Ontario Regulation 490/09 Designated Substances, as amended.

1.3 DESIGNATED SUBSTANCES

.1 Confirm with the Departmental Representative that no additional designated substances have been brought to the project area prior to beginning work.

.2 Additional designated substances and hazardous materials may exist outside the accessible survey area but are beyond the scope of this project.

.3 Should any additional material, suspected to be a designated substance, be encountered within the project area, any disturbance of such material must be stopped, precautionary measures taken, and the Departmental Representative must be notified immediately. Do not proceed until written instructions have been received.

.1 ACRYLONITRILE: Not Identified

.2 ARSENIC: Not Identified

.3 ASBESTOS: **Identified**

.1 The following non-friable Asbestos-Containing Material has been identified and/or suspected in the project area:

.1 Transite/Asbestos-cement sewer pipe

.4 BENZENE: Not Identified

.5 COKE OVEN EMISSIONS: Not Identified

.6 ETHYLENE OXIDE: Identified

.7 ISOCYANATES: Not Identified

.8 LEAD: Not Identified

.9 MERCURY: Not Identified

.10 SILICA: **Identified**

.1 Free crystalline silica is expected to be present in concrete sewer pipes in the project area.

.11 VINYL CHLORIDE MONOMER: Not Identified

.12 Polychlorinated Biphenyls (PCBs): Not Identified

.13 Ozone Depleting Substances (ODS): Not Identified

.14 Other hazardous materials: Not Identified

1.4 RECOMMENDATIONS

.1 ASBESTOS

.1 All work must be done in accordance with O.Reg 278/05 (as amended).

.1 Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable ACMs such as asbestos cement sewer pipes, can be conducted using Type 1 asbestos precautionary measures, provided the material is wetted to control the spread of dust or fibres, and the work is done only by means of non-powered hand- held tools. If these conditions cannot be

met, then more stringent (Type 2 or Type 3) work procedures are required.

.2 Disposal of asbestos waste must be done in accordance with "General – Waste Management" O.Reg 347/90 (as amended) under the Ontario Environmental Protection Act and the federal Transportation of Dangerous Goods Act. The waste must be disposed at a licensed waste disposal site. Proper notification must be issued to the Departmental Representative prior to transportation of waste.

.2 SILICA

.1 Comply with Ontario Regulations O.Reg 490/09 when performing works that may disturb silica-containing materials.

.2 Follow recommendations provided in the MoL Guideline entitled "Guideline: Silica on Construction Projects". This document classifies all silica disturbances as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Provide physical space and make arrangements for meetings.

.4 Preside at meetings.

.5 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.6 Reproduce and distribute copies of minutes within 3 days after meetings and transmit to meeting participants and Authorities Having Jurisdiction not in attendance.

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

1.3 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, and major Subcontractors will be in attendance.

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

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

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Construction Progress Schedule: in accordance with Section 01 00 10 – General Instructions.

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Delivery schedule of specified equipment.

.6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.7 Traffic control requirements in accordance with Section 01 35 00.06 – Special Procedures for Traffic Control.

.8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.9 Owner provided products.

.10 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.11 Monthly progress claims, administrative procedures, photographs, hold backs.

.12 Appointment of inspection and testing agencies or firms.

.13 Insurances, transcript of policies.

1.4 PROGRESS MEETINGS

.1 During course of Work and one week prior to project completion, schedule progress meetings every week.

.2 Departmental Representative, Contractor, and major Subcontractors will be in attendance.

.3 Notify parties minimum 5 days prior to meetings.

.4 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

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

.12 Health and Safety:

.1 Health and safety review on proposed upcoming work.

.2 Health and safety concerns, incidents/accidents, and corrective measures in the previous week of Work.

.3 Other information required by Departmental Representative or relevant to agenda for upcoming progress meeting.

.13 Other business.

1.5 SAFETY MEETINGS

.1 Conduct mandatory daily safety meetings for Site personnel. Include:

.1 Refresher training for existing equipment and protocols.

.2 Review ongoing safety issues and protocols.

.3 Examine new site conditions as encountered.

.2 Hold additional safety meetings on as-needed basis.

1.6 CONTRACT CLOSE-OUT MEETING

.1 Request a meeting of parties in contract to discuss the results of the Work performed, challenges arising from the Work and the implemented solutions and lessons learned.

.2 Departmental Representative, Contractor, and major Subcontractors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned a minimum of 7 days before meeting.

.4 Agenda to include:

.1 Summary of the site activities.

.2 Comparison of progress achieved with the Project Schedule.

.3 Confirmation of quantities.

.4 Health, safety, and security issues.

.5 Summary of all interactions with third parties.

.6 Lessons learned

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section

1.2 DEFINITIONS

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

1.3 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract time and no claim for extension by reason of such default will be allowed. Unless otherwise specified, submittals will be provided to the Departmental Representative at least 5 days prior to the required acceptance.

.2 Electronic submittals sent for Departmental Representative approval may be submitted in .pdf file format.

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

.4 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.5 Where items or information is not produced in SI Metric units converted values are acceptable.

.6 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

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

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

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

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

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

1.4 SHOP DRAWINGS AND PRODUCT DATA

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

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

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

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

.5 Accompany submissions with transmittal letter, in duplicate, containing:

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

.6 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

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

.8 Submit 3 prints of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.9 Submit 3 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.10 Submit 1 electronic and 1 hard copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

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

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

.11 Submit 1 electronic and 1 hard copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.12 Delete information not applicable to project.

.13 Supplement standard information to provide details applicable to project.

.14 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.15 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract documents.

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

1.5 SAMPLES

.1 Submit for review samples in duplicate as requested in this specification. Label samples with origin and intended use.

.2 Deliver samples of each type of proposed backfill material prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

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

.6 Make changes in samples which Departmental Representative may require, consistent with Contract documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg, standard resolution, monthly with progress statement.

.2 Submit photographs of surrounding properties, objects, and structures liable to be damaged or be the subject of subsequent claims.

.3 Project identification: name and number of project and date of exposure indicated.

.4 Number of viewpoints: 2 locations.

.5 Frequency of photographic documentation: weekly.

.1 Upon completion of: excavation and backfilling.

1.7 CERTIFICATES AND TRANSCRIPTS

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 11 16.01 - Granular Sub-base.

.2 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCES

.1 Ministry of Transportation, Ontario (MTO)

.1 Ontario Traffic Manual, Book 7: Temporary Conditions (2014).

1.3 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Traffic Control Plan(s) to address the requirements of items of this Section:

.1 1.4 – Protection of Public Transport

.2 1.5 – Informational and Warning Devices

.3 1.6 – Control of Public Traffic

.4 1.7 – Operational Requirements

1.4 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.

.2 When working on travelled way:

.1 Place equipment in position to minimize interference and hazard to travelling public.

.2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.

.3 Do not leave equipment on travelled way overnight.

.3 Close lanes of road only after receipt of written approval from Departmental Representative.

.1 Before re-routing traffic erect suitable signs and devices to Ontario Traffic Manual, Book 7: Temporary Conditions.

.4 Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.

.1 Provide 7 m wide minimum temporary roadway for traffic in two-way sections through Work and on detours.

.2 Provide 6 m wide minimum temporary roadway for traffic in one-way sections through Work and on detours.

.5 Provide gravelled detours or temporary roads as required to facilitate passage of traffic around restricted construction area:

.1 Place and compact granular sub-base in accordance with Section 32 11 16.01 - Granular Sub-base.

.2 Place and compact granular base in accordance with Section 32 11 23 - Aggregate Base Courses.

.6 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, except where other means of road access exist that meet approval of Departmental Representative.

1.5 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices to Ontario Traffic Manual, Book 7: Temporary Conditions.

.3 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Departmental Representative.

.4 Continually maintain traffic control devices in use:

.1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Remove or cover signs which do not apply to conditions existing from day to day.

1.6 CONTROL OF PUBLIC TRAFFIC

.1 Provide competent flag personnel, trained in accordance with, and properly equipped to Ontario Traffic Manual, Book 7: Temporary Conditions for situations as follows:

.1 When public traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.7 Delays to public traffic due to contractor's operators: 15 minutes maximum.

1.7 OPERATIONAL REQUIREMENTS

.1 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified and approved by Departmental Representative to protect and control public traffic, to levels acceptable to local authorities having jurisdiction.

.2 Maintain existing conditions for traffic crossing right-of-way.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavating, Trenching, and Backfilling

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-51M-81, Polyethylene Sheet for Use in Building Construction.

.2 Transportation and Dangerous Goods Act (1999)

.3 Canadian Council of Ministers of the Environment (CCME) Documentation:

.1 Canadian Environmental Quality Guidelines (2017)

.4 Environment Canada's Best Practices for the Reduction of Air Emissions from Construction and Demolitions Activities

.5 City of Ottawa Sewer Use By-Law (2003-514)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit a Hazardous Materials Management Plan for Departmental Representative review detailing management of hazardous wastes, including written documentation of weekly hazardous waste inspections in accordance with item 1.21 – Removal and Disposal of this Section.

.3 Site Layout for each phase of Work: submit site layout drawings showing existing conditions and facilities, construction facilities and temporary controls provided by Contractor including following:

.1 Drum staging areas.

.2 Equipment and personnel decontamination areas.

.3 Means of ingress, egress and temporary traffic control facilities in accordance with Sections 01 35 00.06 – Special Procedures for Traffic Control and Section 01 56 00 - Temporary Barriers and Enclosures for traffic control.

.4 Equipment and material staging areas.

.5 Soil stockpile areas and demolition debris stockpile areas.

.6 Zones specified in Contractor's site-specific Health and Safety Plan.

.7 Grading, including contours, required to construct temporary facilities.

.8 Wastewater storage or treatment facilities.

.9 Equipment Decontamination Facility.

.10 Construction facilities as indicated in Section 01 52 00 – Construction Facilities.

.4 Equipment Decontamination Pad: submit equipment decontamination pad design (including final dimensions) to Departmental Representative for review in accordance with item 2.2 – Equipment Decontamination Pad in this Section.

.5 Submit Wastewater Management Plan in accordance with item 1.9 – Design Requirements, 1.16 – Water Control, and 1.17 – Dewatering in this Section for Departmental Representative approval.

.6 Submit a Dust and Soil Tracking Control Plan in accordance with items 1.12 – Dust and Particulate Control, 1.13 – Tracking Control, and 1.14 – Dust Monitoring in this Section detailing measures to be taken to minimize the release of airborne particulates during all work activities, the tracking of soil onto public roadways, and methods to be used to clean compacted surfaces. Dust and soil tracking control plan to be approved by Departmental Representative.

.7 Submit Erosion and Sediment Control Plan, for Departmental Representative approval, to accommodate requirements provided in item 1.18 – Erosion and Sediment Control of this Section

.8 Submit a Pollution Control Plan, for Departmental Representative approval, outlining process to prevent release of noxious toxic substances and pollutants produced by construction operations detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials and in accordance with item 1.15 – Pollution Control in this Section. Pollution Control Plan to also include:

.1 Hazardous Materials Management Plan.

.2 Equipment Decontamination Pad design.

.3 Wastewater Management Plan.

.4 Dust and Soil Tracking Control Plan

1.4 REGULATORY REQUIREMENTS

.1 Comply with federal, provincial, and local anti-pollution laws, ordinances, codes, and regulations when disposing of waste materials, debris, and rubbish.

.2 Work to meet or exceed minimum requirements established by federal, provincial, and local laws and regulations which are applicable.

.1 Contractor: responsible for complying with amendments as they become effective.

.3 In event that compliance exceeds scope of work or conflicts with specific requirements of contract notify Departmental Representative immediately.

1.5 SEQUENCING AND SCHEDULING

.1 Do not commence Work involving contact with potentially contaminated materials until decontamination facilities are operational and approved by Departmental Representative.

1.6 EQUIPMENT DECONTAMINATION AND DECONTAMINATION FACILITY

.1 Prior to commencing work involving equipment contact with potentially contaminated materials, construct equipment decontamination pad, in accordance with item 2.2 – Equipment Decontamination Pad of this Section, to accommodate largest piece of on-site potentially contaminated equipment.

.2 The decontamination pad may be a portable design, and shall be located to prevent recontamination of equipment prior to entry onto public roads.

.3 The Contractor shall be responsible for operating, modifying, improving, or replacing the decontamination pad to meet the criteria of 1.6.1 and 1.6.2 above.

.4 Provide, operate, and maintain suitable portable, high-pressure, low-volume decontamination wash unit(s) equipped with self-contained water storage tank and pressurizing system and capable of heating and maintaining wash waters to 80 degrees C and providing nozzle pressure of 1,035 kpa.

.5 Provide, operate, and maintain necessary equipment, pumps, and piping required to collect and contain equipment decontamination wastewater and sediment and transfer materials to approved storage facilities.

.6 Equipment Decontamination:

.1 Decontaminate equipment after working in potentially contaminated work areas and prior to subsequent work or travel on clean areas.

.2 Perform equipment decontamination on Contractor-constructed equipment decontamination pad.

.3 Collect decontamination wastewaters and sediments which accumulate on equipment decontamination pad. Transfer wastewaters to designated wastewater storage area.

.4 Dispose of sediments as Non-Hazardous CCME Contaminated Soil as defined in Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

.5 Furnish and equip personnel engaged in equipment decontamination with protective equipment including suitable disposable clothing, respiratory protection, and face shields, as required.

.6 Have on hand sufficient pumping equipment, of adequate pumping capacity and associated machinery and piping in good working condition for ordinary emergencies, including power outage, and competent workers for operation of pumping equipment. Maintain piping and connections in good condition and leak-free.

1.7 DRUM STAGING PAD

.1 No bulk storage of fuel, oil, or other lubrication products will be permitted on the project Site, unless explicitly approved in writing by the Departmental Representative. Equipment fuelling and oil change operations shall be undertaken in an area specified by the Departmental Representative and only after suitable means of spill containment have been implemented.

.2 Provide, maintain, and operate drum staging pad as required and approved of by Departmental Representative.

.3 If drums will be stored on Site, construct drum staging pad with sump capable of collecting leachate and rain runoff. Place polyethylene sheeting such that sheeting contours over top of berm, and leachate and runoff from staging pad is directed solely to sump on staging pad.

.4 Prior to commencing work involving handling of drums and other containers, submit procedures for safe handling of drums and other containers. Implement and enforce drum handling program during activities involving drummed waste characterization including but not limited to handling, opening, sampling, staging, and consolidating.

1.8 SOIL STOCKPILING FACILITIES

.1 Storage/stockpiling of Non-hazardous CCME Contaminated Soil in Work Area is prohibited.

.2 Provide, maintain, and operate storage/stockpiling facilities of Clean backfill material as required. Identify storage/stockpiling locations on Site Layout for each phase of Work.

.3 Stockpile heights are not to exceed the height of the site hoarding.

1.9 DESIGN REQUIREMENTS

.1 Waste Water Management: Contractor to arrange for collection, removal, and disposal of all wastewater from Site in accordance with all applicable regulations. Wastewater includes any water from excavation dewatering activities, wash water from vehicles, equipment and personnel decontamination, wash basin and all other wastewater generated on Site during construction. Wastewater may be treated prior to being discharged into the municipal sewer networks in order to meet municipal sewer discharge by-laws or may be collected and disposed of by a licensed waste contractor at a facility that is licensed to accept the liquid. If wastewater is to be treated on Site, Contractor to provide a wastewater treatment system design, approvals, and installation as part of the Wastewater Management Plan. Wastewater Treatment system design to be stamped by a licensed Engineer in the Province of Ontario.

1.10 DRUMS

.1 Storage of Liquid Waste: 200 L steel drums meeting Transportation and Dangerous Goods Act, closable lids, complete with labels for marking contents and date filled.

.2 Storage of Solid Waste: 200 L steel drums meeting Transportation and Dangerous Goods Act, closable lids, complete with labels for marking contents and date filled.

1.11 VEHICULAR ACCESS AND PARKING

.1 Maintenance and Use:

.1 Prevent contamination of access roads. Immediately scrape up debris or material on access roads which is suspected to be contaminated as determined by Departmental Representative; transport and dispose of in appropriate off-site disposal facility. Clean access roads at least once per shift.

.2 Departmental Representative may collect soil samples for chemical analyses from traveling surfaces of constructed and existing access routes prior to, during, and upon completion of Work. Excavate and dispose of clean soil contaminated by Contractor's activities at no additional cost to Departmental Representative.

1.12 DUST AND PARTICULATE CONTROL

.1 Execute Work by methods provided in Contractor's approved Dust Control and Soil Tracking Plan to minimize raising dust from construction operations.

.2 Implement and maintain dust and particulate control measures immediately during construction and in accordance with Province of Ontario regulations and Environment Canada's Best Practices for the Reduction of Air Emissions from Construction and Demolitions Activities.

.3 Dust control measures shall include:

- .1 Instructing workers on dust control methods.
- .2 Adjustment of the excavation rate, grading activities, and soil handling to minimize dust emission.
- .3 Use of tarpaulins over haulage trucks.
- .4 Monitoring of dust emission visually and taking action to suppress dust, as necessary.
- .5 Monitoring wind conditions and adjusting excavation, soil handling, and/or haulage rates or suspending work, as necessary.
- .6 Supply and have available at all times, suitable dust suppressant equipment to control and prevent dust on the work site.
- .7 Responding to dust complaints from the public and taking action as necessary to further control dust.
- .8 Provide positive means to prevent airborne dust from dispersing into atmosphere. Use potable water for water misting system for dust and particulate control.

.4 Use chemical means for water misting system for dust and particulate control only with Departmental Representative's prior written approval.

.5 As minimum, use appropriate covers on trucks hauling fine or dusty material. Use watertight vehicles to haul wet materials.

.6 Prevent dust from spreading to adjacent property sites.

.7 Departmental Representative will stop work at any time when Contractor's control of dusts and particulates is inadequate for wind conditions present at site, or when Departmental Representative air quality monitoring results (as indicated in item 1.14 – Dust Monitoring of this Section) indicates that release of fugitive dusts and particulates into atmosphere equals or exceeds specified levels.

.8 If Contractor's dust and particulate control is not sufficient for controlling dusts and particulates into atmosphere, stop work. Contractor must discuss procedures that Contractor proposes to resolve problem. Make necessary changes to operations prior to resuming excavation, handling, processing, or other work that may cause release of dusts or particulates.

1.13 TRACKING CONTROL

.1 Take all necessary precautions to prevent the tracking of soil waste onto municipal roadways and private properties. All moving of equipment off the work area is to be controlled through a decontamination zone, which is to include a decontamination pad, and monitoring station, as detailed in the Specifications. The Contractor shall immediately clean all debris and dust deposits resulting from the work, to the satisfaction of the Departmental Representative, using strict dust control measures, as detailed in item 1.12 – Dust and Particulate Control above. Dry sweeping of roadways, sidewalks, curb, etc. as well as flushing into the municipal sewer will not be tolerated.

1.14 DUST MONITORING

.1 Contractor to implement Dust Control and Soil Tracking Plan in accordance with the following items in this Section:

- .1 1.12 – Dust and Particulate Control
- .2 1.13 – Tracking Control

.2 The Departmental Representative will monitor dust emissions, as well as the effectiveness of Contractor's dust control methods and complaints or reports from the public and compare them to project criteria.

.3 The Departmental Representative shall implement a formal dust monitoring and reporting program using dust samplers to measure airborne particulate loadings generated on the Site to verify whether Contractor's dust control procedures are adequate.

1.15 POLLUTION CONTROL

.1 Pollution Control Plan:

- .1 Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious toxic substances and pollutants produced by construction operations.
- .2 Be prepared to intercept, clean up, and dispose of spills or releases that may occur whether on land or water. Maintain materials and equipment required for cleanup of spills or releases readily accessible on Site.
- .3 Promptly report spills and releases potentially causing damage to environment to:
  - .1 Ontario Ministry of Environment and Climate Change Spills Action Centre (1-800-268-6060).
  - .2 Owner of pollutant.
  - .3 Person having control over pollutant.
  - .4 Departmental Representative.
- .4 Contact manufacturer of pollutant and ascertain hazards involved, precautions required, and measures used in cleanup or mitigating action.
- .5 Take immediate action using available resources to contain and mitigate effects on environment and persons from spill or release.

.6 Provide spill response materials including, containers, adsorbent, shovels, and personal protective equipment. Make spill response materials available at all times in which hazardous materials or wastes are being handled or transported. Spill response materials: compatible with type of material being handled.

1.16 WATER CONTROL

.1 Take all necessary precautions to prevent non-filtered or contaminated water from entering the storm and sanitary systems or discharge beyond or outside the work area along surface routes, in compliance with the City of Ottawa Sewer Use By-Law. The Contractor shall seal all manhole covers and construct sludge traps around all storm water catch basins. The Contractor shall also inspect and/or clean out all sludge traps on a scheduled basis to ensure their satisfactory performance.

.2 Maintain excavations free of water.

.3 Protect site from puddling or running water. Grade site to drain. Provide water barriers as necessary to protect site from soil erosion.

.4 Prevent surface water runoff from leaving work areas.

.5 Do not discharge decontaminated water, or surface water runoff, or groundwater which may have come in contact with potentially contaminated material, off site or to municipal sewers without written approval of Departmental Representative.

.6 Direct surface waters that have not contacted potentially contaminated materials to existing surface drainage systems.

.7 Control surface drainage including ensuring that gutters are kept open, water is not directed across or over pavements or sidewalks except through approved pipes or properly constructed troughs, and runoff from unstabilized areas is intercepted and diverted to suitable outlet.

.8 Dispose of water in manner not injurious to public health or safety, to property, or to any part of Work completed or under construction.

.9 Provide, operate, and maintain necessary equipment appropriately sized to keep excavations, staging pads, and other work areas free from water.

.10 Have on hand sufficient pumping equipment, machinery, and tankage in good working condition for ordinary emergencies, including power outage, and competent workers for operation of pumping equipment.

.11 Contain and collect wastewaters and transfer such collected wastewaters to Contractor - supplied areas.

1.17 DEWATERING

.1 Dewater various parts of Work including, without limitation, excavations, structures, foundations, and work areas.

.2 Employ construction methods, plant procedures, and precautions that ensure Work, including excavations, are stable, free from disturbance, and dry.

.3 Dewatering Methods: includes sheeting and shoring; groundwater control systems; surface or free water control systems employing ditches, diversions, drains, pipes and/or pumps; and other measures necessary to enable Work to be carried out in dry conditions.

.4 Provide sufficient and appropriate labour, plant, and equipment necessary to keep Work free of water including standby equipment necessary to ensure continuous operation of dewatering system.

.5 Take precautions necessary to prevent uplift of structure or pipeline and to protect excavations from flooding and damage due to surface runoff.

.6 Provide access to Departmental Representative to sample and analyze water generated from dewatering activities. Treat water to meet required discharge or disposal criteria or store and dispose of water using a licensed contractor and facility licensed to accept the water in accordance with:

.1 Applicable regulations.

.2 Approved Wastewater Management Plan.

.3 Item 1.9 Design Requirements of this Section.

1.18 EROSION AND SEDIMENT CONTROL

.1 Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas. Prevent erosion and sedimentation.

.2 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical. Strip vegetation, regrade, or otherwise develop to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and water courses, and repair damage caused by soil erosion and sedimentation.

.3 Provide and maintain temporary measures which may include, silt fences, hay or straw bales, ditches, geotextiles, drains, berms, terracing, riprap, temporary drainage piping, sedimentation basins, vegetative cover, dikes, and other construction required to prevent erosion and migration of silt, mud, sediment, and other debris off site or to other areas of site where damage might result, or that might otherwise be required by Laws and Regulations. Make sediment control measures available during construction.

.4 Do not disturb existing embankments or embankment protection.

.5 Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

.6 If soil and debris from site accumulate in low areas, storm sewers, roadways, gutters, ditches, or other areas where in Departmental Representative's determination it is undesirable, remove accumulation and restore area to original condition.

1.19 PROGRESS CLEANING

.1 Maintain cleanliness of Work and surrounding site to comply with federal, provincial, and local fire and safety laws, ordinances, codes, and regulations.

.2 Co-ordinate cleaning operations with disposal operations to prevent accumulation of dust, dirt, debris, rubbish, and waste materials.

1.20 FINAL DECONTAMINATION

.1 Perform final decontamination of construction facilities, equipment, and materials which may have come in contact with potentially contaminated materials prior to removal from site.

.2 Perform decontamination as specified to satisfaction of Departmental Representative.

1.21 REMOVAL AND DISPOSAL

.1 Remove surplus materials and temporary facilities from site.

.2 Dispose of non-contaminated waste materials, litter, debris, and rubbish off site.

.3 Do not burn or bury rubbish and waste materials on site.

.4 Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

.5 Do not discharge wastes into streams or waterways.

.6 Dispose of following materials at appropriate off-site facility identified by Contractor and approved by Departmental Representative:

- .1 Debris including excess construction material.
- .2 Non-contaminated litter and rubbish.
- .3 Disposable PPE worn during final cleaning.
- .4 Wastewater removed from wastewater storage tank.
- .5 Wastewater generated from decontamination operations including wastewater storage tank cleaning.
- .6 Lumber from decontamination pads.

.7 Dispose of materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.8 Dispose of excavated Non-Hazardous CCME Contaminated Soil in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.9 Wastewater sample and analysis: Departmental Representative will perform sampling and analysis of stored wastewater for disposal purposes prior to removal from site. Results of analyses will determine whether wastewater may be disposed to storm or sanitary sewers without treatment, whether treatment is required prior to disposal to sewers, or whether wastewater shall be removed from the Site by a licensed waste contractor and disposed of at a facility licensed to accept the waste.

.10 Submit Hazardous Materials Management Plan detailing the need to:

- .1 Provide documentation verifying that hazardous materials employees have been trained, tested, and certified to safely and effectively carry out their assigned duties in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites prior to handling of hazardous materials.
- .2 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

.3 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:

.1 Hazardous wastes recycled in manner constituting disposal;

.2 Hazardous waste burned for energy recovery;

.3 Lead-acid battery recycling;

.4 Hazardous wastes with economically recoverable precious metals.

.4 Audit the quantity and use of hazardous material.

.5 Conduct weekly audits of the quantity, type, reason for use, and disposal of any hazardous material used during Work.

1.22 RECORD KEEPING

.1 Maintain adequate records to support information provided to Departmental Representative regarding exception reports, annual reports, and biennial reports.

.2 Maintain bills of ladings for minimum of 375 days from date of shipment or longer period required by applicable law or regulation.

Part 2 Products

2.1 EQUIPMENT

.1 The Contractor shall supply, operate, and maintain equipment, tools and supplies suitable for the work required to be undertaken, clean, free of defects and in compliance with regulatory and safety requirements. The Contractor shall provide:

.1 All fuel and lubricants required to operate the equipment;

.2 All maintenance and repairs necessary to keep equipment and tools in good condition and working order.

.2 No bulk storage of fuel, oil, or other lubrication products will be permitted on the project Site, unless explicitly approved in writing by the Departmental Representative. Equipment fuelling and oil change operations shall be undertaken in an area specified by the Departmental Representative and only after suitable means of spill containment have been implemented.

.3 The Contractor shall undertake regular preventative maintenance on major equipment off-hours to avoid delays in the work. Should a breakdown of major equipment occur, the Contractor shall immediately arrange for repair or replacement of the defective unit. Under no circumstances will delays associated with equipment breakdown be allowed to exceed one day (24 hours). All costs associated with repairs or replacement shall be at the expense of the Contractor, including project delays.

.4 Should the Contractor fail to repair or replace the defective equipment within the specified period of time, the Departmental Representative will take all necessary steps to replace the equipment and the total cost of the replacement, including all associated expenses incurred by the Departmental Representative, shall be the responsibility of the Contractor.

2.2 EQUIPMENT DECONTAMINATION PAD

.1 The decontamination pad may be a portable design, and shall be located to prevent recontamination of equipment prior to entry onto public roads.

.2 Provide, operate, and maintain suitable portable, high-pressure, low-volume decontamination wash unit(s) equipped with self-contained water storage tank and pressurizing system and capable of heating and maintaining wash waters to 80 degrees C and providing nozzle pressure of 1,035 kPa.

.3 Provide, operate, and maintain necessary equipment, pumps, and piping required to collect and contain equipment decontamination wastewater and sediment and transfer materials to approved storage facilities.

2.3 POLLUTION CONTROL

.1 Provide spill response materials, including containers, adsorbent, shovels, and personal protective equipment. Make spill response materials available at all times in which hazardous materials or wastes are being handled or transported. Spill response materials shall be compatible with the type of material being handled as indicated in the applicable MSDS forms.

2.4 EROSION AND SEDIMENT CONTROL

.1 Silt Fence: Assembled, ready to install unit consisting of geotextile attached to driveable posts.

.2 Geotextile: Uniform in texture and appearance, having no defects, flaws or tears that would affect its physical properties; and contains sufficient ultraviolet ray inhibitor and stabilizers to provide minimum 2-year service life from outdoor experience.

.3 Net Backing: Industrial polypropylene mesh joined to geotextile at both top and bottom with double stitching of heavy-duty cord, with minimum width of 750 mm.

.4 Posts: Sharpened wood, approximately 50 mm square, protruding below bottom of geotextile to allow minimum 450 mm embedment; post spacing 2.4 m maximum. Securely fasten each post to geotextile and net backing using suitable staples.

Part 3 Execution

3.1 EQUIPMENT DECONTAMINATION FACILITY

.1 The Contractor shall be responsible for operating, modifying, improving, or replacing the decontamination pad to meet the criteria of item 2.2 – Equipment Decontamination Pad of this Section.

3.2 DUST MONITORING

.1 Should the dust control measures implemented by the Contractor not address the problem to the satisfaction of the Departmental Representative, the activities generating dust shall be discontinued until conditions change to allow the operation to continue in compliance with the requirements.

.2 Should the Departmental Representative determine that the weather conditions are such that the control of dust emission becomes difficult or that exposure may occur, the Contractor will be ordered to stop any operation that is aggravating the condition and take the appropriate mitigating action.

.3 The Contractor shall not resume the ceased activities or operations until, in the opinion of the Departmental Representative, weather conditions and/or site conditions are suitable.

3.3 EQUIPMENT DECONTAMINATION

.1 At minimum, perform the following steps during equipment decontamination: mechanically remove packed dirt, grit, and debris by scraping and brushing without using steam or high-pressure water to reduce the amount of water needed and to reduce the amount of contaminated rinsate generated. Use high-pressure, low-volume, hot water or steam supplemented by detergents or solvents as appropriate and as approved by Departmental Representative. Pay particular attention to tire treads, equipment tracks, springs, joints, sprockets, and undercarriages. Scrub surfaces with long handle brushes and cleaning agent. Rinse off and collect cleaning agent. Air dry equipment in designated clean zone of decontamination facility before removing from Site or travelling on clean areas. Perform assessment as directed by Departmental Representative to determine effectiveness of decontamination.

.2 Maintain inspection record on Site which includes: equipment descriptions with identification numbers or license plates; time and date entering decontamination facility; time and date exiting decontamination facility; and name of inspector with comment stating that decontamination was performed and completed.

.3 Each piece of equipment will be inspected by Departmental Representative after decontamination and prior to removal from Site and/or travel on clean areas. Departmental Representative will have right to require additional decontamination to be completed if deemed necessary.

.4 Take appropriate measures necessary to minimize drift of mist and spray during decontamination including provision of wind screens, as required.

3.4 EROSION AND SEDIMENT CONTROL

.1 Installation:

.1 Check erosion and sediment control measures weekly after each rainfall; during prolonged rainfall, check daily.

.2 Bales and/or silt fence may be removed at beginning of work day and replaced at end of work day.

.3 Whenever sedimentation is caused by stripping vegetation, regrading, or other development, remove it from adjoining surfaces, drainage systems, and watercourses, and repair damage as quickly as possible.

.4 Prior to or during construction, Departmental Representative may require installation or construction of improvements to prevent or correct temporary conditions on Site. Improvements may include berms, mulching, sediment traps, detention and retention basins, grading and other measures appropriate to specific condition. Temporary improvements must remain in place and in operation as necessary.

.5 Unless Departmental Representative indicates otherwise, remove temporary erosion and sediment control devices upon completion of Work. Spread accumulated sediments to form a suitable surface for seeding or dispose of, and shape area to permit natural drainage to satisfaction of Department Representative. Materials once removed become property of Contractor.

.6 Construct fill areas by selective placement to avoid erosive surface silts or clays.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 82 00.01 – Asbestos Abatement – Minimum Precautions.

1.2 REFERENCES

.1 City of Ottawa Noise By-law (2004-253)

.2 Province of Ontario

- .1 Occupational Health and Safety Act, R.S.O. 2004.
- .2 Ontario Regulation 381/15: Noise

.3 Canada Labour Code

- .1 Canada Occupational Safety and Health Regulations 2002.
- .2 OS+H Regulation SOR/98-598, Part VII Levels of Sound.

.4 Workplace Hazardous Materials Information System (WHMIS) Regulation, R.R.O.

1.3 DEFINITIONS

.1 Health and Safety Officer – On-site Contractor representative responsible for health and safety and implementing of site-specific Health and Safety Plan (SSHSP) related to the Work.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit SSHSP to Departmental Representative for review. The SSHSP will include, but is not limited to the following sections:

- .1 A Statement of Contractor's Safety Policy.
- .2 Safety Responsibilities of all on-site personnel.
- .3 Safe Work Practices and/or Job Procedures including a hazard analysis for each site task and operation.
- .4 Results of safety and health risk or hazard analysis for demolition, excavation, and reinstatement activities
- .5 Name and telephone number of Contractor's corporate Health and Safety Officer and on-site Safety Representative.
- .6 Personal Protective Equipment Program
- .7 Emergency response requirements, including On and Off-site Contingency and Emergency Response Plan.
- .8 Fire Safety Plan.
- .9 Call-in Procedures.
- .10 Safety Incident Reporting Mechanism.

.3 Develop checklist for items to be inspected on a daily basis. Document actions taken.

.4 Personal Protective Equipment Program addressing:

.1 Personnel training requirements including:

.1 Names of personnel and alternates responsible for site safety and health, hazards present on site, and use of personal protective equipment.

.2 Work practices by which personnel can minimize risks from hazards, safe use of engineering controls and equipment on site, medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards, and elements of the SSHSP.

.2 Personal protective equipment (PPE) procedures addressing:

.1 Donning and doffing procedures.

.2 PPE selection based upon site hazards.

.3 PPE use and limitations of equipment.

.4 Work mission duration, PPE maintenance and storage.

.5 PPE decontamination and disposal.

.6 PPE inspection procedures prior to, during, and after use.

.7 Evaluation of effectiveness of PPE program, and limitations during temperature extremes, and other appropriate medical considerations.

.5 Medical surveillance requirements for personnel assigned to work at site.

.6 Site control measures employed at site including site map, site work zones, use of 'buddy system', site communications including site security, alerting means for emergencies, standard operating procedures or safe work practices, and identification of nearest medical assistance.

.7 Emergency response requirements addressing:

.1 Pre-emergency planning.

.2 Personnel roles, lines of authority and communication.

.3 Emergency recognition and prevention.

.4 Safe distances and places of refuge, site security and control, evacuation routes and procedures.

.5 Emergency medical treatment and first aid.

.6 Emergency alerting and response procedures, critique of response and follow-up.

.7 PPE and emergency equipment.

.8 Site topography, layout, prevailing weather conditions, and procedures for reporting incidents to the local, provincial, or federal agencies.

.8 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

.9 Off-site Contingency and Emergency Response Plan:

.1 Prior to commencing Work involving handling of hazardous materials, develop off-site Contingency and Emergency Response Plan.

.2 Plan must provide immediate response to serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from site.

.10 Written respiratory protection program for project activities.

.11 Procedures dealing with heat and/or cold stress.

.12 Confined space entry procedures.

.13 Spill containment program if drummed waste material is generated, excavated, stored, or managed on site in accordance with the Pollution Control Plan provided in Section 01 35 13.43 Special Project Procedures for Contaminated Sites

.14 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 days after receipt of comments from Departmental Representative.

.15 Maintain the SSHSP throughout the Work.

1.5 REGULATORY REQUIREMENTS

.1 Comply with specified standards and regulations to ensure safe operations at site containing hazardous or toxic materials.

.2 Comply with federal, provincial, and municipal noise regulations during Work.

1.6 SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Soils contaminated with polycyclic aromatic hydrocarbons (PAHs) and various metals.

.2 Asbestos containing materials in the form of two subsurface concrete drainage pipes scheduled for removal and off-site disposal, as indicated on Drawing D1 – Excavation and Selected Site Demolition Plan

1.7 GENERAL REQUIREMENTS

.1 Develop written SSHSP prior to commencing site Work and continue to implement, maintain, and enforce plan until final demobilization from site. SSHSP must address project specifications.

.2 Ensure health and safety guidelines provide for safe and minimal risk working environment for site personnel and minimize impact of activities involving contact with hazardous materials or hazardous wastes on general public and surrounding environment.

.3 Request for relief from or substitution of the approved SSHSP must be submitted to the Departmental Representative in writing. Departmental Representative will respond in writing, either accepting or requesting improvements.

1.8 RESPONSIBILITY

.1 Be responsible for safety of persons and property on site and for protection of persons off 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, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 HAZARD COMMUNICATION REQUIREMENTS

.1 Comply with Workplace Hazardous Materials Information System (WHMIS) Regulation, R.R.O.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations, Part X - Hazardous Substances.

.3 Provide Departmental Representative with Material Safety Data Sheets (MSDS) and documentation on any "hazardous" chemical that Contractor or Contractor Representatives plan to bring onto site.

1.10 WORK STOPPAGE

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

.2 Assign responsibility and obligation to Health and Safety Officer where required to stop or start Work when, at Health and Safety Officer's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

1.11 UNFORESEEN HAZARDS

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

1.12 HEALTH AND SAFETY OFFICER

.1 Employ and assign to Work competent and authorized representative as Health and Safety Officer. Health and Safety Officer must:

.1 Have site-related working experience specific to activities associated with soil remediation and excavation.

.2 Have basic working knowledge of specified occupational safety and health regulations.

.3 Be responsible for completing health and safety training session and ensuring that personnel not successfully completing the required training are not permitted to enter site to perform Work in Exclusion Zone or Contaminant Reduction Zone.

.4 Be responsible for implementing, enforcing daily and monitoring SSHSP.

.5 Be on site during execution of Work.

1.13 PERSONNEL HEALTH, SAFETY, AND HYGIENE

.1 Training: ensure personnel entering site are trained in accordance with specified personnel training requirements. Training session must be completed by Health and Safety Officer.

.2 Levels of Protection: establish levels of protection for each Work area based on planned activity and location of activity. Minimum PPE required for each level of protection as follows:

.1 Level D for all work except for removal of asbestos containing material in the form of two subsurface concrete drainage pipes:

.1 Head, Eye, Ear Protection: hard hat, safety glasses with sideshields, ear muffs or plugs.

.2 Clothing: standard work uniform.

.3 Hand Protection: work gloves suitable to the task. Disposable gloves to be worn over work gloves and disposed at the end of each shift if hand contact with soil or other contaminants is possible based on the task performed.

.4 Foot Protection: safety boots.

.2 Removal of asbestos containing material:

.1 As indicated in Section – 02 82 00.01 Asbestos Abatement – Minimum Precautions.

.3 Personal Protective Equipment:

.1 Furnish site personnel with appropriate PPE as specified above. Ensure that safety equipment and protective clothing is kept clean and maintained.

.4 Develop protective equipment usage procedures and ensure that procedures are strictly followed by site personnel; include following procedures as minimum:

.1 Ensure prescription eyeglasses worn are safety glasses and do not permit contact lenses on site within work zones.

.2 Ensure footwear is steel-toed safety shoes or boots and is covered by rubber overshoes when entering or working in potentially contaminated work areas.

.3 Dispose of or decontaminate PPE worn on site at end of each workday.

.4 Decontaminate reusable PPE before reissuing.

.5 Ensure site personnel have passed respirator fit test prior to entering potentially contaminated work areas requiring respiratory protection.

.6 Ensure facial hair does not interfere with proper respirator fit.

.5 Heat Stress/Cold Stress: implement heat stress and/or cold stress monitoring program as applicable and include in SSHSP.

.6 Personnel Hygiene and Personnel Decontamination Procedures. Provide minimum as follows:

.1 Suitable containers for storage and disposal of used disposable PPE.

.2 Potable water and suitable sanitation facility.

.7 Emergency and First-Aid Equipment:

.1 Locate and maintain emergency and first-aid equipment in appropriate location on site including first-aid kit to accommodate number of site personnel; portable emergency eye wash; two 9 kg ABC type dry chemical fire extinguishers.

.2 2 self-contained breathing apparatus units; blankets and towels; stretcher; and 1 hand-held emergency siren.

.3 As minimum, provide 1 certified first-aid technician on site at all times when work activities are in progress.

.8 Site Communications:

.1 Post emergency numbers near site telephones.

.2 Ensure personnel use of "buddy" system and develop hand signal system appropriate for site activities.

.3 Provide employee alarm system to notify employees of site emergency situations or to stop Work activities if necessary.

.4 Furnish selected personnel with 2-way radios.

.5 Safety Meetings: conduct mandatory daily safety meetings for personnel, and additionally as required by special or work-related conditions; include refresher training for existing equipment and protocols, review ongoing safety issues and protocols, and examine new site conditions as encountered. Hold additional safety meetings on as-needed basis.

1.14 DUST AND PARTICULATE CONTROL

.1 Control dust and particulates related to Work in accordance with Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

1.15 CONTINGENCY AND EMERGENCY RESPONSE

.1 Meet specified requirements.

.2 Arrange and attend co-ordination meeting held with appropriate authorities including City, Fire, Hospital, Provincial and City Police, Ministry of Transportation, Ministry of Health, and Community Emergency Co-ordinator; meeting will identify off-site Emergency Response Co-ordinator through whom information and co-ordination will occur in event of incident.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section

1.2 REFERENCES

.1 Reference Standards:

.1 Ontario Environmental Protection Act (RSO 1990);

.2 Ontario Water Resources Act (RSO 1990);

.3 Ontario Regulation 558/00 – Waste Management;

.4 Canadian Environmental Protection Act (1999);

.5 Canadian Environmental Quality Guidelines, CCME (2017);

1.3 DEFINITIONS

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

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit Environmental Protection Plan for review and approval by Departmental Representative.

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

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

.3 Include in Environmental Protection Plan:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.

.3 Names and qualifications of persons responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

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

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

.8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

1.5 FIRES

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

1.6 DRAINAGE

.1 Provide temporary drainage and pumping as necessary to keep excavation and Site free from water in accordance with Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

1.7 SITE CLEARING AND PLANT PROTECTION

.1 Restrict tree removal to areas indicated.

1.8 WORK ADJACENT TO WATERWAYS

.1 Not Used.

1.9 POLLUTION CONTROL

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

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

.3 Prevent extraneous materials from contaminating air and waterways beyond application area by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads in accordance with Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

1.10 HISTORICAL/ARCHAEOLOGICAL CONTROL

.1 Ensure protection of known or discovered resources and notify Departmental Representative immediately.

1.11 NOTIFICATION

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

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

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section

1.2 INSPECTION

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

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

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

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

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 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 orderly sequence to not cause delays in Work.

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

1.5 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.

1.6 REPORTS

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

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be authorized as recoverable by Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

.1 For each phase of Work, prepare site plan indicating proposed location and dimensions of area where fencing/hoarding is to be placed and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

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

.3 Indicate use of supplemental or other staging area.

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

.5 Remove from site all such work after use.

1.5 SITE STORAGE/LOADING

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

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

1.6 CONSTRUCTION PARKING

.1 Parking is not permitted on site apart from equipment required to complete the Work.

1.7 OFFICES

.1 Provide temporary heated and ventilated office facilities at Contractor laydown area for use by the Contractor. Facilities shall be of sufficient size to accommodate site meetings including Contractor, Departmental Representative, and up to 6 persons and furnished with drawing laydown table.

.2 Provide marked and fully stocked first-aid case in a readily available location.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

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

1.9 SANITARY FACILITIES

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

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

1.10 CONSTRUCTION SIGNAGE

.1 No signs or advertisements, other than warning signs, traffic control signage, and vehicle directional signage are permitted on site.

.2 Signs and notices for safety and instruction in both official languages. Graphic symbols to CAN/CSA-Z321.

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

1.11 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic in accordance with Section 01 35 00.06 – Special Procedures for Traffic Control.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

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

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

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor responsible for repair of damage to roads and utility services or utility tunnels caused by construction operations.

.7 Construct access and haul roads necessary.

.8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

.9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

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

.11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.13 Provide snow removal during period of Work.

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

1.12 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site regularly in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Clean dirt or mud tracked onto paved or surfaced roadways as per Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Refer to Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

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

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such temporary controls after use.

1.4 HOARDING

.1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.

.2 Apply plywood panels, vertically flush and butt jointed.

.3 Provide two lockable truck entrance gates and at least one pedestrian door conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.

.4 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.

.5 Paint public side of site enclosure with one coat primer to CAN/CGSB 1.189 and one coat of exterior paint (grey) to CGSB 1.59. Maintain public side of enclosure in clean condition.

.6 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.5 GUARD RAILS AND BARRICADES

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

.2 Provide as required by governing authorities.

1.6 WEATHER ENCLOSURES

.1 Design enclosures to withstand wind pressure and snow loading.

1.7 DUST TIGHT SCREENS

.1 Provide and install screens on all building air intakes as to prevent dust, generated during Work, to entre the buildings ventilation system as directed by the Departmental Representative. Building air intakes are labelled 'Steel Grate' on Drawing C1 – Existing Conditions and Topographic Survey Plan.

1.8 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.9 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.10 FIRE ROUTES

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

1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.12 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.

1.13 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

.1 Accomplish maximum control of solid construction waste.

.2 Protect environment and prevent environmental pollution damage.

1.2 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.3 REFERENCES

.1 Definitions:

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

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

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

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

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

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

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

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

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

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

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare and submit before final payment summary of waste materials salvaged for reuse, recycling or disposal.

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

.2 For each material landfilled or incinerated from project, include amount in tonnes of material and identity of landfill or incinerator.

1.5 WASTE AUDIT (WA)

.1 To be completed in accordance with Section 01 00 10 – General Instructions.

1.6 WASTE REDUCTION WORKPLAN (WRW)

.1 To be completed in accordance with Section 01 00 10 – General Instructions.

1.7 WASTE SOURCE SEPARATION PROGRAM (WSSP)

.1 To be completed in accordance with Section 01 00 10 – General Instructions.

1.8 WASTE PROCESSING SITES

.1 Province of Ontario.

.1 Name: Ministry of the Environment and Climate Change

.2 Telephone: 1-800-565-4923

.3 Fax: 416-323-4682

1.9 STORAGE, HANDLING AND PROTECTION

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

.2 Unless specified otherwise, materials for removal become Contractor's property and shall be taken from the Site.

.3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

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

.5 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.

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

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

1.10 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, or paint thinner into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.11 SCHEDULING

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

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

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section

Part 2 Products

2.1 Not Used

.1 Not Used.

Part 3 Execution

3.1 PREPARATION

.1 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.

.2 Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

3.2 REMOVAL

.1 Remove existing asphalt pavement, to lines indicated on Drawing D1 – Excavation and Selected Site Demolition, and dispose off-site.

.2 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

.3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.4 Suppress dust generated by removal process.

3.3 FINISH TOLERANCES

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

3.4 CLEANING

.1 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following work:

.1 Remove storm and sanitary drains, as indicated on Drawing D1 – Excavation and Selected Site Demolition Plan, that are presumed to be asbestos-containing material, without the use of power tools, through the use of a manual pipe cutter.

1.2 RELATED REQUIREMENTS

.1 Comply with Federal, Provincial, and local requirements pertaining to asbestos provided so that in case of conflict among these requirements or with these specifications, the more stringent requirement applies. Comply with regulations in effect at time work is performed.

1.3 REFERENCES

.1 Government of Ontario

.1 O. Reg. 278/05 Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations, under the Occupational Health and Safety Act (OHSA).

.2 O. Reg. 490/09 Designated Substances, made under the Occupational Health and Safety Act (OHSA).

.3 Regulation 347/90 of the Revised Regulations of Ontario, amended to O. Reg. 461/05 and 217/08, General – Waste Management.

1.4 DEFINITIONS

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.

.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 per cent or more asbestos by dry weight and are identified under 1.8 Existing Conditions of this Section and on Drawing C1 – Existing Conditions and Topographic Survey Plan, including fallen materials and settled dust.

.4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.

.5 Authorized Visitors: Engineers, Consultants or designated representatives, and representatives of regulatory agencies.

.6 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the work.

.2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.7 Friable material: means material that:

.1 When dry, can be crumbled, pulverized or powdered by hand pressure, or

.2 is crumbled, pulverized or powdered.

.8 Pipe cutter: non-powered handheld tool capable of manually cutting a pipe by the use of a sharp wheel and adjustable jaw grips. Used by rotating it around the pipe and repeatedly tightening it until it cuts all of the way through. Must be appropriate size for work.

.9 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.10 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.

.11 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.12 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with provincial regulations.

.3 Submit proof of Contractor's Asbestos Liability Insurance.

.4 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed. at the completion of the work.

.5 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.6 Submit proof satisfactory to Departmental Representative employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.

.2 Health and Safety:

.1 Perform construction occupational health and safety in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites.

.2 Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Air purifying half-mask respirator with P-100 particulate filter cartridges, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

.2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.3 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area.

.6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

.2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.3 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 mils bags or leak proof drums. Label containers with appropriate warning labels.

.4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 EXISTING CONDITIONS

.1 The cement pipe to be removed is presumed to be ACM and should be handled accordingly until proven otherwise. There are no existing reports and information pertaining to analysis of the cement pipe to determine if asbestos fibres are present.

.2 Notify Departmental Representative of friable material discovered during work and not apparent from drawings, specifications, or report pertaining to work. Do not disturb such material pending instructions from Departmental Representative.

1.9 SCHEDULING

.1 Hours of Work: perform work during normal working hours.

1.10 PERSONNEL TRAINING

.1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, following minimum requirements:

.1 Fitting of equipment.

.2 Inspection and maintenance of equipment.

.3 Disinfecting of equipment.

.4 Limitations of equipment.

.3 Instruction and training must be provided by a competent, qualified person.

Part 2 Products

2.1 MATERIALS

.1 Drop Sheets:

.1 Polyethylene: 0.15 mm thick.

.2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

.3 Waste Containers: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene waste bag.

.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.

.4 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.

.5 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

Part 3 Execution

3.1 PROCEDURES

.1 Work occupational health and safety in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites.

.2 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.

.1 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.

.2 Do not use compressed air to clean up or remove dust from any surface.

.3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over Asbestos Work Area where dust and contamination cannot otherwise be safely contained. Drop sheets are not to be reused.

.4 Wet cement pipe containing asbestos where it is to be cut.

.1 Use garden reservoir type low - velocity fine - mist sprayer.

.2 Cut cement pipe into manageable segments using a manual pipe cutter.

.3 Segments of the cement pipe are to be wrapped in Polyethylene once it is cut so that it is dust-tight and placed in the designated containers.

.4 Perform work to reduce dust creation to lowest levels practicable.

.5 Work will be subject to visual inspection.

.5 Frequently and at regular intervals during Work and immediately on completion of work:

.1 Dust and waste to be cleaned up and removed using a vacuum equipped with a HEPA filter and placed in a waste container, and

.2 Drop sheets to be wetted and placed in a waste container as soon as practicable.

.6 Cleanup:

.1 Place dust and asbestos containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.

.2 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.

.3 Seal waste bags and remove from site. Dispose of in accordance with Provincial and Federal regulations. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that the appropriate guidelines and regulations for asbestos disposal are followed.

.4 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast-in-Place Concrete.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
- .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
- .4 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
- .5 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

- .1 Use wood and wood product formwork materials to CSA-O121.

.2 Only new formwork shall be used for exposed concrete surfaces.

.3 Form ties:

- .1 Use removable or snap-off metal ties, fixed or adjustable length.
  - .1 Use only ties with ends removable to a distance of not less than 38 mm from the face of the finished concrete.
  - .2 Form ties with a removable cone cast in the concrete shall produce a cone hole not holes larger than 25 mm diameter in concrete surface.

.4 Form release agent:

- .1 Use chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
- .2 Form release agent shall be non-toxic and shall not contain any ingredients that could be a source of contamination of potable water.

.5 Falsework materials: to CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Do not place shores and mud sills on frozen ground.

.4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.5 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1.

.6 Align form joints and make watertight.

.1 Keep form joints to minimum.

.7 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise.

.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.10 Clean formwork in accordance with CSA-A23.1, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Remove forms so that no damage occurs to concrete.

.2 Consider the location, character of the structure, weather and other conditions influencing the curing of concrete, in determining the time for removal of forms. (Refer to Section 03 30 00 – Cast-in-Place Concrete and CSA-A23.1.)

.3 Leaves shores in place until concrete has attained sufficient strength to adequately support its own weight together with construction loads likely to be imposed.

.1 Vertical structures – minimum 24 hours.

.2 Other surfaces – until concrete has attained 75% of the specified 28 day strength, unless otherwise approved by the Departmental Representative.

.4 Re-use formwork and falsework subject to requirements of CSA-A23.1.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 REFERENCES

.1 CSA International

.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.

.3 CSA G30.5-M1983 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement

.4 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.5 CSA-G40.20/G40.21-04(R2009) General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures, including placing of reinforcement, at least five (5) days before fabrication.

.2 Indicate on shop drawings, bar-bending details, bar schedule, quantities of reinforcement, sizes, spacings, locations of reinforcement splices, and concrete cover, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with RSIC Reinforcing Steel Manual of Standard Practice.

.3 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

1.4 QUALITY ASSURANCE

.1 Inform Departmental Representative of proposed source of material to be supplied a minimum of five (5) days prior to scheduled work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Ship bar reinforcement in standard bundles, clearly identified in accordance with bar bending details and lists.

.2 Store reinforcement to prevent deterioration or contamination by dirt, detrimental rust, loose scale, paint, oil or other foreign substance likely to destroy or reduce bond.

.3 Do not straighten or re-bend reinforcement in any manner.

.4 Do not use bars kinked or bent by improper handling or storage.

Part 2 Products

2.1 MATERIALS

.1 Reinforcing steel: Provide deformed reinforcing bars as per structural drawing, unless indicated otherwise.

.2 Chairs, bar supports & spacers to CAN/CSA A23.1

.3 Injectable adhesive shall be hybrid adhesive formulated to include resin and hardener to provide optimal curing speed as well as high strength and stiffness.

Part 3 Execution

3.1 PREPARATION

.1 Not Used.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated on reviewed shop drawings.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on Drawing S1 – Sign Post Details and in accordance with CSA-A23.1.

.2 Ensure cover to reinforcement is maintained during concrete pour.

.3 Clean reinforcing steel bars prior to placing concrete.

.4 Welding of reinforcement will not be permitted.

.5 Splice reinforcement only as shown on Drawing S1 – Sign Post Details or if approved by the Departmental Representative.

.1 Bar splices shall conform to CSA-A23.3 (Class B), unless noted.

.2 Lap adjacent sheets of wire fabric to provide an overlap of at least one cross wire spacing plus 50mm, measured between the outermost cross wires of each sheet.

.6 Support reinforcement as follows:

.1 Beams, walls, and columns - laterally support reinforcement with supports in pairs on opposite faces.

.2 Do not use supports that will be forced into the supporting formwork or soil by the weight of the reinforcement or other construction loads.

.3 Separate layers of bars by precast mortar blocks, bars or equally suitable devices. Do not use pebbles, pieces of broken stone or brick, metal pipe or wooden blocks.

.4 Do not place bars on layers of fresh concrete as the work progresses or install bars during placing of concrete.

3.4 INSPECTION

.1 Notify Departmental Representative to permit inspection after placement is complete. Reinforcing for all concrete pours shall be inspected and approved after placing and prior to concreting.

.2 Provide adequate notice of scheduled pours to facilitate inspection of reinforcements (minimum of 48 hours).

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 REFERENCES

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

.1 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-19.4-M90, Multi-Compound, Chemical Curing Sealing Compound.

.3 Canadian Standards Association (CSA)

.1 CSA A23.1/A23.2-09, 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).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Provide Departmental Representative with:

.1 Concrete mix design.

.2 Aggregate gradation curves.

.2 Submit samples of aggregates, water and cement to be used, to an approved testing agency, if required by the Departmental Representative.

.3 Submit mill certificates for cement and supplementary cementing materials required by Departmental Representative.

.4 Submit details of proposed product substitutions (if any) with technical data sheets to demonstrate equivalency to produce specified before proceeding with the work, at least 10 days in advance of concreting.

1.4 QUALITY ASSURANCE

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

Part 2 Products

2.1 MATERIALS

.1 Portland Cement: to CSA A3001, Type GU.

.2 Blended hydraulic cement: to CSA A3001-03.

.3 Other cementing materials: to CAN/CSA-A300 & A23.1.

.4 Grout: 50MPa Non-shrink grout mix.

.5 Hydrophilic Rubber Waterstop:

.1 Provide rubber adhesive, epoxy gel and single component hydrophilic sealant in accordance with manufacturer's written recommendations.

.6 Bonding agent: Cement modified epoxy resin.

2.2 MIXES

.1 Contractor shall be responsible for concrete mix design.

.2 Proportion concrete in accordance with CAN/CSA-A23.1.

.3 Minimum compressive strength at 28 days as indicated on Contract Drawings.

.4 Nominal maximum size of coarse aggregate: to CAN/CSA-A23.1.

.5 Slump: to CAN/CSA-A23.1.

.6 Air Content: concrete to contain purposely entrained air in accordance with CSA-A23.1, Table 10. In no case shall air content be less than 4%.

.7 Do not change concrete mix without prior revision by Departmental Representative. Should change in material source be proposed, Departmental Representative shall review new mix design.

Part 3 Execution

3.1 INSPECTION

.1 The Departmental Representative will inspect forms, foundations, reinforcing steel, mixing, conveying and placing equipment before concreting.

.1 Provide 48 hours minimum notice prior to placing of concrete.

.2 Inform Departmental Representative of proposed method(s) for protection of concrete during placing and curing of concrete during adverse weather prior to placing of concrete.

3.2 PREPARATION

.1 Do not place concrete on soil that has been softened by mechanical disturbance or moisture.

.2 Saturate granular subgrade prior to placing concrete and maintain in damp state until completion of placement operation. Do not place concrete into standing water.

.3 Make suitable arrangements to prevent damage to fresh concrete by adverse weather conditions, such as rain, wind or extreme temperatures.

.4 Concrete shall not be poured against frozen ground, frozen concrete, frozen rock, frozen stone or into frosted formwork.

.5 Prepare all sleeves and ducts to be cast into concrete at the same time as the concrete formwork to ensure that correct assembly and fit is obtained.

3.3 INSERTS

.1 Place all inserts and embedded hardware in accordance with Section 13 of CSA-A23.3 (unless noted).

.2 Do not eliminate or displace reinforcement to accommodate hardware.

.3 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete

3.4 WATERSTOP

.1 Installation of waterstops to be in accordance with manufacturer's written recommendations.

.2 Store waterstops to protect from oil, dirt, sunlight and premature exposure to water.

.3 Provide keyway in joint face of first concrete pour to accept waterstop.

.1 Locate hydrophilic waterstop in middle third of wall or slab, ensuring minimum 50mm cover at all times.

.4 Clean concrete surface using wire brush or other mechanical means to remove all laitance, dirt and other debris or foreign matter.

.5 Cut hydrophilic waterstop to fit, cutting ends square (or at proper angle for mitred corners) with shears or sharp blade to fit splices together without overlaps.

.6 Seal splices using cyanacrylate adhesive.

.7 Bond to concrete surface in accordance with manufacturer's written recommendations to suit concrete surface conditions.

3.5 PLACING OF CONCRETE

.1 According to CSA-A23.1, and as specified herein and as indicated on Drawing C4 – Details 1.

.2 All formwork shall be cleaned of all debris, loose material, snow and ice immediately prior to pouring.

.3 Ensure proper placement and support of reinforcement and embedded material immediately ahead of a pour.

.4 Do not temporarily displace reinforcement for convenience in placing concrete.

.5 Do not use wood or other temporary spreaders or spacers.

.6 Do not insert reinforcement into fresh concrete unless approved by Department Representative.

.7 Pumping of concrete shall be permitted only after review of equipment and mix.

.8 Confine concrete in a suitable vertical drop pipe to within 1.0 m or less of the concrete in place.

.9 Set screeds accurately for level surfaces or to maintain cambers as required.

.10 Ensure that concrete is adequately consolidated in the forms.

.11 Place concrete in such a manner that the concrete in the form is still plastic and can be integrated with fresh concrete.

.12 To prevent segregation, deposit concrete in approximately horizontal layers of 300 to 450 mm thickness, as near as possible to its final position.

.13 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.14 Do not place load upon new concrete until adequate strength has been attained.

3.6 ANCHOR BOLTS

.1 Set anchor bolts to templates in coordination with appropriate trade prior to placing concrete.

3.7 PLACING GROUT

.1 Grout under baseplates and machinery using procedures in accordance with manufacturer's written recommendations that result in 100% contact over grouted area.

3.8 COLD WEATHER

.1 When the air temperature is at or below 5°C, or when there is a possibility of it falling to that limit within 24 hours of placing, the requirements according to CSA-A23.1 shall be met.

.2 Calcium chloride to 2% may only be used upon written approval of the Departmental Representative.

.3 Withdraw protection and heat gradually so that air temperature around the concrete does not drop more than 15 ^{O}C per day.

.4 Concrete shall be protected from alternate freezing and thawing for 14 days.

.5 Provide enclosures for heating such that air circulation is maintained.

.6 Frozen concrete will be rejected.

3.9 HOT WEATHER

.1 Hot weather shall be considered to be an air temperature in the shade, of 23°C or greater.

.2 Hot weather methods shall conform to CSA-A23.1.

.3 The concrete temperature at the time of placing in hot weather shall not exceed those specified in CSA-A23.1. In the event that this limit is exceeded the concrete operations shall be suspended until the constituent materials of concrete are cooled.

.4 Retarding admixtures shall be used only if approved by the Departmental Representative prior to use in the concrete.

3.10 JOINTS

.1 Construction, and/or control joints shall be provided where required and as shown on the plans or according to CSA-A23.1. Control joints should be spaced at maximum 6 meters or less unless otherwise indicated.

.2 Carefully finish all face edges exposed to view true to line and elevation. Apply a neat cement paste or approved bonding agent to the hardened concrete immediately in advance of the fresh concrete.

.3 Make all construction, or control joints in accordance with details shown on the drawings, layout to be submitted by Contractor for approval by Departmental Representative.

.4 Construction joint layouts shown on the drawings take precedence over above requirements.

3.11 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials shall be carried out by an independent Certified Testing Laboratory approved by the Departmental Representative in accordance with CAN/CSA-A23.1 and A23.2.

.2 Contractor shall provide and maintain adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the initial curing period.

.1 Adequate facilities shall include a protected, designated area with provision for a continuous power supply to comply with CSA Test Method A23.2-3C.

.3 The Departmental Representative may request additional cylinders. Cure cylinders on job site under same conditions as concrete which they represent.

.1 Cost of testing additional cylinders that comply with contract specifications will be paid for by the Departmental Representative.

.2 Cost of testing additional cylinders that do not comply with contract specifications will be paid for by the contractor.

.4 Inspection and/or testing by the Departmental Representative will not augment or replace Contractor Quality Control, nor relieve him of contractual responsibilities.

3.12 FINISHING

.1 To CSA-A23.1 and as specified herein:

.2 Ordinary surface finish.

.1 Use on concrete surfaces not exposed to view in the completed structure.

.2 Chip off fins and irregular projections.

.3 Patch honeycomb and fill tie holes with mortar containing approved bonding agent. Mix according to manufacturer's directions.

.3 Rubbed finish.

.1 Use on formed concrete exposed to view in the completed structure.

.2 Remove fins and projections, patch honeycomb and fill tie holes as required.

.3 Saturate with water and rub with medium coarse carborundum stone using a small amount of cement-sand mortar.

.4 Continue rubbing until a uniform surface with no irregularities is obtained. Do not remove the paste produced by this rubbing.

.5 Carry out final rubbing with a fine stone and water.

.6 After the surface is dry, remove loose powder by rubbing with burlap.

.7 Leave final surface free from unsound patches, paste, powder and objectionable marks.

.4 Floated surface finish.

.1 Strike off the compacted concrete to the cross-section and elevation shown on the drawings. Keep a slight excess of concrete in front of the screed at all times.

.2 Obtain a uniform surface by floating as necessary. If floating is not completed before excess water appears at the surface, remove this water before continuing with floating.

.3 Add or remove concrete during floating as required to obtain a surface with no more than 3 mm deviation from the required surface in any 3 metre length.

.4 Do not overwork the concrete surface. Float only enough to obtain a dense uniform surface.

.5 Broomed finish.

.1 Exterior walkways, driveways or landings, shall receive a broomed non-slip surface.

.2 After completion of Article 3.11.4.4, broom to produce a non-slip surface with regular corrugations not more than 3 mm deep.

.6 Troweled finish.

.1 After completion of Article 3.11.4.4, trowel to produce a dense smooth finish.

3.13 CURING

.1 Cure and protect concrete in accordance with CSA-A23.1.

.2 Do not use curing compounds where bond is required by subsequent pours or topping.

3.14 FORM REMOVAL

.1 Forms shall not be removed until removal operations will cause no damage to concrete surfaces.

.2 See Clause 11 CSA-A23.1 for specific requirements.

3.15 PATCHING & FINISHING OF HARDENED CONCRETE

.1 Patching, if required and if allowed, shall be done immediately after stripping.

.2 All form ties shall be cut back a minimum of 25 mm and all tie holes shall be neatly patched and rubbed down.

3.16 CONCRETE SPECIALTIES

.1 Provide and install all concrete specialties as shown on the drawing and/or as necessary to complete the concrete work.

.2 Included are fibreboard expansion joint covers, water stop and bond breakers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

.2 Section 32 01 90.33 – Tree and Shrub Preservation.

1.2 REFERENCES

.1 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.4 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites.

1.5 STORAGE AND PROTECTION

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

.2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Disposal of all grubbed stumps and roots to be disposed of as Non-Hazardous Contaminated Soil in accordance with Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures in accordance with Section – 01 35 13.43 – Special Project Procedures for Contaminated Sites.

3.2 TEMPORARY VEGETATION PROTECTION FENCING

.1 Install Temporary Vegetation Protection Fencing as indicated on Drawing L100 - Vegetation Removal and Preservation Plan and under Section 32 01 90.33 – Tree and Shrub Preservation.

3.3 PREPARATION

.1 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility line(s) are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.2 Notify utility authorities before starting clearing / grubbing.

.3 Keep roads and walks free of dirt and debris.

3.4 APPLICATION

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

3.5 CLEARING

.1 Clearing includes satisfactory disposal of vegetation designated for removal, including brush occurring within cleared areas.

3.6 ISOLATED TREES

.1 Grub out isolated tree stumps.

3.7 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated at ground level.

3.8 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

3.9 REMOVAL AND DISPOSAL

.1 Remove cleared / grubbed materials off site to disposal area approved by Departmental Representative.

3.10 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate excavation operations to approval of Departmental Representative.

3.11 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 02 41 13.14 – Asphalt Paving Removal.

.2 Section 31 32 19.01 – Geotextiles

.3 Section 32 01 90.33 – Tree and Shrub Preservation

.4 Section 32 91 19.13 – Topsoil Placement and Grading

.5 Section 32 92 23 – Sodding

.6 Section 32 93 10 – Trees, Shrubs and Ground Cover Planting

1.2 REFERENCES

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

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

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

.3 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-07ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D1557-07, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-13, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 Ontario Provincial Standards Specifications (OPSS)

.1 OPSS.MUNI 1010 – Materials Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Materials.

.2 LS -602, Sieve Analysis of Aggregates, MTO Laboratory Testing Manual

.5 Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for Protection of the Environment and Human Health. 1999, updated 2007/2008.

.6 Ontario Environmental Protection Act, R.S.O. 1990, c.E.19. (amended in 2017)

.1 Ontario Regulation 153/04, as amended.

.2 Ontario Regulation 347, as amended.

.7 Ontario Occupational Health and Safety Act, R.S.O. 1990, c.O.1. (amended in 2016).

.8 Canada Labour Code (amended in 2016), Canada Occupational Health and Safety Regulations (amended in 2016)

1.3 DEFINITIONS

.1 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.2 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.4 Non-Hazardous Contaminated Soil: Soil considered to be non-hazardous with respect to O.Reg.347, as amended, but containing concentrations of analyzed parameters greater than those provided in the Canadian Soil Quality Guidelines for Protection of Environment and Human Health (commercial land use, coarse-textured soil (CCME, 1999)) based on chemical analyses completed by Department Representative prior to Contract execution and from visual observation and chemical analysis completed by the Departmental Representative during Contract execution.

.5 Clean Backfill: Imported fill, meeting percent passing gradation requirements as per OPSS 1010, to be used for the backfilling of excavation(s) that is containing concentrations of analyzed parameters less than those provided in O. Reg. 153/04: Records of Site Condition - PART XV.1 Of the Ontario Environmental Protection Act based on chemical analyses completed by the Departmental Representative prior to backfilling activities during Contract execution,

.6 Borrow Material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.7 Recycled Fill Material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.8 Unsuitable Soil materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.2.

.2 Table:

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

.3 Coarse grained soils containing more than 25 % by mass passing 0.075 mm sieve.

.4 Material containing deleterious materials such as construction debris, concrete, asphalt, or organic matter.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

.2 Submit to Departmental Representative written notice when bottom of excavation is reached.

.3 Submit to Departmental Representative testing and inspection results as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit Pre-work Existing Conditions Survey in accordance with item 1.8 – Existing Conditions of this Section to confirm the information provided on Drawing C1 – Existing Conditions and Topographic Survey Plan.

.2 Submit construction equipment list for major equipment to be used in this Section prior to start of Work.

.3 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, and location plan abandoned services, as required.

.4 Samples:

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

.2 Inform Departmental Representative at least 2 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

.3 Submit 70 kg samples of type of fill specified.

.4 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.

.5 Provide access to backfill soils at least 72 hours prior to use for sampling by Departmental Represented throughout work to confirm material is considered Clean Backfill.

1.5 QUALITY ASSURANCE

.1 Submit design and supporting data at least 2 weeks prior to beginning Work.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

.3 Keep design and supporting data on site.

.4 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.

.1 Provide access to backfill soils for Quality Assurance sampling by Departmental Representative throughout work to confirm backfill material is considered Clean Backfill.

.5 Health and Safety Requirements:

.1 Maintain construction occupational health and safety in accordance with Section 01 35 29.14 – Health and Safety for Contaminated Sites, Province of Ontario Occupational Health and Safety Act, R.S.O (2004) and Canada Labour Code, Canada Occupational Safety and Health Regulations (2002).

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Manage and dispose of excavated soil material in accordance with Part 3 of this Section.

.2 Manage and dispose of Waste material in accordance with Part 3 of this Section.

.3 Asphalt and underlying engineered fill removed as per Section 02 41 13.14 – Asphalt Paving Removal that cannot be efficiently separated from the underlying contaminated soils shall be disposed of with the contaminated soil.

1.7 EXISTING CONDITIONS

.1 Contractor to be knowledgeable of existing site conditions and is to examine:

.1 Drawing C1 – Existing Conditions and Topographic Survey Plan

.2 Attached borehole/groundwater monitoring well records.

.3 Attached soil analytical laboratory results.

.4 Attached Depth to groundwater table.

.2 Buried services:

.1 Before commencing Work verify location of buried services on and adjacent to site. Submit a copy of utility clearances to the Departmental Representative for review prior to beginning Work.

.2 Remove abandoned services indicated for removal: cap cut-offs.

.3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.4 Prior to beginning excavation Work, notify applicable utility providers, establish location and state of use of buried utilities and structures. Utility providers to clearly mark such locations to prevent disturbance during Work.

.5 Confirm locations of buried utilities by careful test excavations. All utilities are to be considered live until notified by Departmental Representative.

.6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered including protection of water lines from freezing.

.7 Where utility lines or structures exist in area of excavation that are not indicated for removal, excavate to the top of the utility and protect the utility using appropriate geotextile materials as indicated in Section 31 32 19.01 - Geotextiles. Utility to be protected until backfilling is complete.

.8 Record location of maintained and abandoned underground lines.

.9 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Confirm condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work in a written 'Pre-work Existing Condition Survey'. Notify Departmental Representatives in writing at least 2 weeks prior to excavation of any discrepancies or features which may be affected by work.

.2 Confirm that existing buildings and retaining wall structures are founded on bedrock by careful test excavation prior to commencing other subsurface work. At locations where existing structures are not founded on bedrock, the excavation should not extend below the underside of foundation.

.3 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.4 An existing above ground argon tank and concrete support pad located just north of the west wing of 555 Booth Street and, as indicated on Drawing D1 – Excavation and Selected Site Demolition Plan, are to be protected during Work.

Part 2 Products

2.1 MATERIALS

.1 Select Subgrade Material: Material meeting gradation requirements in accordance with OPSS.MUNI 1010 – Materials Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Materials.

.2 Granular B Type I: Material meeting gradation requirements in accordance with OPSS.MUNI 1010 – Materials Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Materials.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 In accordance with Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated on Drawing D1 – Excavation and Selected Demolition Plan.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly in accordance with Section 02 41 13.14 – Asphalt Paving Removal.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.

.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 Departmental Representative 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 buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of unpaved areas of excavation as indicated on Drawing D1 – Excavation and Selected Demolition Plan after area has been cleared of grasses and removed from site.

.2 Mix topsoil with subsoil and dispose according to disposal specified for subsoil.

3.5 STOCKPILING

.1 Stockpiling of excavated Non-Hazardous CCME Contaminated Soil in Work area is prohibited.

.2 If Waste material is encountered during excavation activities:

.1 Segregate Waste material from Non-Hazardous CCME Contaminated Soil.

.2 Notify Departmental Representative prior to off-site disposal.

.3 Stockpile of Clean fill materials in area designated on Site Layout Plan prepared by Contractor as per Section 01 35 13.43 – Special Project Procedures for Contaminated Sites

.4 Protect fill materials from contamination.

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

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for the Province of Ontario.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for Departmental Representative review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Protect open excavations against flooding and damage due to surface run-off.

.4 Dispose of water in accordance with the Wastewater Management Plan as indicated in Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

3.8 EXCAVATION

.1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as indicated below and on Drawings.

.1 Side slopes for temporary excavations should conform to the Occupational Health and Safety Act regulations for Construction Projects. The soils at the site are classified as Type 3 soil, temporary excavations walls in Type 3 soil should be sloped from the bottom with a minimum gradient of one horizontal to one vertical. Excavation walls must be stable as to not affect the integrity and stability of the hoarding or the sidewalks, utilities, or other features beyond the hoarding. Where the limits of excavation are specified as vertical at the property line, refer to Drawing No. D1, the following restrictions must be followed: excavation side walls should not be vertical for more than a 2 m length in plan, at one time. Vertical side walls should be backfilled to one horizontal to one vertical same day of excavation. Workers must be restricted from accessing the zone of one slope height measured away from the excavation toe. Vertical side walls are not permissible during periods of precipitation. Sidewalks adjacent to the vertical side wall must be closed during the excavation and backfilling process.

.2 Excavate all soil and Waste materials up to the excavation lines as indicated on Drawings except for soil/waste materials present inside the excavation lines which could potentially undermine the sidewalk or other structures as agreed to by the Departmental Representative.

.3 At locations where foundations are not founded on bedrock, excavation should not extend below the underside of foundation.

.4 Soil underlying existing underground utilities and in immediate vicinity of and required for protection of utilities to be left in place.

.5 Soil required to support the above ground argon tanks and concrete support pad are to be protected. A detail illustrating excavation requirements in this area are provided on Drawing D1 – Excavation and Selected Demolition Plan.

.6 Geotextile is to be installed:

.1 Surrounding sub drains.

.2 Areas of the Site where Non-Hazardous CCME Contaminated Soil is to be left in place as indicated above.

.7 Existing underground utilities exposed through excavation shall be thermally protected from freezing until backfilling commences.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Keep excavated and stockpiled materials safe distance away from edge of excavation as directed by Departmental Representative.

.5 Restrict vehicle operations directly adjacent to open excavations.

.6 Dispose of excavated material, in accordance with O.Reg. 347, as amended.

.1 Non-Hazardous CCME Contaminated Soil and Waste materials shall be disposed at a licensed Ontario Ministry of Environment and Climate Change-approved landfill.

.7 Bottoms of excavations to be undisturbed rock, level, free from loose, soft or organic matter, except as noted in 3.8.2. Notify Departmental Representative if disturbed rock / loose material is encountered within excavation prior to removal. Disturbed rock / loose material is not to be removed or disposed without Departmental Representative approval.

.8 Notify Departmental Representative when bottom of excavation is reached.

.9 Obtain Departmental Representative approval of completed excavation.

.10 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.11 Correct unauthorized over-excavation as follows:

.1 Fill with Select Subgrade Material compacted to not less than 95% of corrected Standard Proctor maximum dry density in accordance with ASTM D 698.

.12 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.9 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below to backfill excavation. Compaction densities are percentages of maximum densities obtained from ASTM D698.

.1 Exterior side of perimeter walls: use Granular B Type I to subgrade level. Compact to a minimum of 95% of standard Proctor maximum dry density.

.2 Under asphalt: use Select Subgrade Material (SSM) as fill to subgrade level, placed in loose lifts not exceeding 300 mm in height and compacted to a minimum of 95% standard Proctor maximum dry density.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Refer to:

.1 Drawing C7 – Details IV for the installation of bedding and backfill material of underground services to be installed as indicated on Drawing C2 – Site Servicing Plan.

.2 Section 31 32 19.01– Geotextiles for the application of geotextile material around bedding/backfill material to be left in place for the protection of underground services.

3.11 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 Departmental Representative has inspected and approved installations and backfill material.

.2 Allow Departmental Representative to collect soil samples (from excavation walls, areas soil left in place) prior to installation of geotextile and backfilling.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow, debris, or not considered Clean through Departmental Representative sampling and analytical testing.

.4 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated on Drawing C3 – Parking Lot Grading and Reinstatement Plan. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

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

.3 Place layers simultaneously on both sides of installed Work to equalize loading.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.

3.12 RESTORATION

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

.2 Replace topsoil in accordance with Section 32 91 19.13 – Topsoil Placement and Grading.

.3 Reinstate lawns, in accordance with Section 32 92 23 – Sodding, to elevation which existed before excavation.

.4 Reinstate pavements, sidewalks, curbs, fences and handrails disturbed by excavation to thickness, structure and elevation which existed before excavation.

.5 Clean areas affected by Work.

.6 Reinstate trees and shrubs in accordance with Section 32 93 10 – Trees, Shrubs, and Ground Cover Planting.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 ASTM International

- .1 ASTM A123/A123M-0], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM D4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- .3 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- .4 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- .5 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
- .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
  - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
  - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
  - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
  - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
  - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.3 CSA International

- .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 Ontario Provincial Standard Specifications (OPSS)

- .1 OPSS 1860-November 2010, Material Specification for Geotextiles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:

.1 Store materialsin accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect geotextiles from direct sunlight and UV rays.

.3 Replace defective or damaged materials with new.

.3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

.1 Geotextile: non-woven or equivalent product approved by the Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions are acceptable for geotextile material installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Place geotextile material onto surfaces as indicated in Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 200 mm over previously laid strip.

.5 Join successive strips of geotextile by sewing.

.6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

.8 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

SUMMARY ANALYTICAL RESULTS

Table 1
Summary of Maximum Soil Concentrations
555 Booth Street, Ottawa, Ontario

Project #R.082784.002

Parameter	Units	Maximum Concentration
General Chemistry		
Cyanide, Total	mg/kg	2.7
pH	S.U.	7.39
BTEX		
Benzene	mg/kg	<0.04
Toluene	mg/kg	<0.04
Ethylbenzene	mg/kg	<0.04
Xylene, o-	mg/kg	<0.03
Xylene, m/p-	mg/kg	<0.03
Xylene, Total	mg/kg	<0.12
Petroleum Hydrocarbons		
PHC F1 (C6-C10 range)	mg/kg	<10
PHC F2 (>C10-C16 range)	mg/kg	21
PHC F3 (>C16-C34 range)	mg/kg	906
PHC F4 (>C34-C50 range)	mg/kg	328
Aliphatic Hydrochlorocarbons		
Hexachlorobutadiene	mg/kg	<0.01
Hexachloroethane	mg/kg	<0.014
Trichloroethylene	mg/kg	<0.01
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	mg/kg	0.461
Acenaphthylene	mg/kg	2.83
Anthracene	mg/kg	2.22
Benzo(a)anthracene	mg/kg	45
Benzo(a)pyrene	mg/kg	50
Benzo(b)fluoranthene	mg/kg	60
Benzo(g,h,i)perylene	mg/kg	7.85
Benzo(k)fluoranthene	mg/kg	31
Biphenyl, 1,1-	mg/kg	<0.6
Bis(2-chloroethyl)ether	mg/kg	<0.6
Bis(2-chloroisopropyl)ether	mg/kg	<0.6
Bis(2-ethylhexyl)ether Phthalate	mg/kg	<10
Chloroaniline, 4-	mg/kg	<0.6
Chlorophenol, 2-	mg/kg	<0.6
Chrysene	mg/kg	12.8
Dibenzo(a,h)anthracene	mg/kg	7.1
Dichlorobenzene, 1,2-	mg/kg	<0.3
Dichlorobenzene, 1,3-	mg/kg	<0.3
Dichlorobenzene, 1,4-	mg/kg	<0.3
Dichlorobenzidine, 3,3'-	mg/kg	<1
Dichlorophenol, 2,4-	mg/kg	<0.6
Diethyl Phthalate	mg/kg	<3
Dimethylphenol, 2,4-	mg/kg	<3
Dimethyl Phthalate	mg/kg	<3
Dinitrophenol, 2,4-	mg/kg	<3
Dinitrotoluene, 2,4-	mg/kg	<0.6
Fluoranthene	mg/kg	26.6
Fluorene	mg/kg	0.879
Hexachlorobenzene	mg/kg	<0.3
Hexachlorobutadiene	mg/kg	<0.3
Hexachloroethane	mg/kg	<0.6
Indeno(1,2,3-cd)pyrene	mg/kg	23
Methylnaphthalene, 1-	mg/kg	0.138
Methylnaphthalene, 2-	mg/kg	0.212
Naphthalene	mg/kg	9.3
Pentachlorophenol	mg/kg	<0.6
Phenanthrene	mg/kg	130
Phenol	mg/kg	<0.3
Pyrene	mg/kg	91
Trichlorobenzene, 1,2,4-	mg/kg	<0.6
Trichlorophenol, 2,4,5-	mg/kg	<0.6
Trichlorophenol, 2,4,6-	mg/kg	<0.6

Continued on next page

Table 1
Summary of Maximum Soil Concentrations
555 Booth Street, Ottawa, Ontario

Project #R.082784.002

Parameter	Units	Maximum Concentration
Metals and Inorganics		
Aluminum	mg/kg	8,170
Antimony	mg/kg	34
Arsenic	mg/kg	16
Barium	mg/kg	780
Beryllium	mg/kg	0.8
Boron (Hot Water Soluble)	mg/kg	0.56
Boron, Total	mg/kg	9.8
Cadmium	mg/kg	4.3
Chromium (VI)	mg/kg	0.57
Chromium, Total	mg/kg	190
Cobalt	mg/kg	22
Copper	mg/kg	450
Iron	mg/kg	10,900
Lead	mg/kg	970
Manganese	mg/kg	211
Mercury	mg/kg	0.88
Molybdenum	mg/kg	16
Nickel	mg/kg	69
Phosphorus	mg/kg	684
Selenium	mg/kg	3.8
Silver	mg/kg	28
Tin	mg/kg	118
Titanium	mg/kg	610
Uranium	mg/kg	0.9
Vanadium	mg/kg	51
Zinc	mg/kg	1,600
Volatile Organic Compounds		
Acetone	mg/kg	<0.02
Bromodichloromethane	mg/kg	<0.02
Bromoform (Tribromomethane)	mg/kg	<0.02
Bromomethane (Methyl bromide)	mg/kg	<0.05
Carbon Tetrachloride (Tetrachloromethane)	mg/kg	<0.05
Chlorobenzene (Monochlorobenzene)	mg/kg	<0.02
Chloroform (Trichloromethane)	mg/kg	<0.02
Dibromochloromethane	mg/kg	<0.02
Dichlorobenzene, 1,2-	mg/kg	<0.05
Dichlorobenzene, 1,3-	mg/kg	<0.05
Dichlorobenzene, 1,4-	mg/kg	<0.05
Dichlorodifluoromethane (Freon 12)	mg/kg	<0.05
Dichloroethane, 1,1-	mg/kg	<0.02
Dichloroethane, 1,2-	mg/kg	<0.02
Dichloroethene, 1,1-	mg/kg	<0.02
Dichloroethene, cis-1,2-	mg/kg	<0.02
Dichloroethene, trans-1,2-	mg/kg	<0.02
Dichloropropane, 1,2-	mg/kg	<0.02
Dichloropropene, cis-1,3-	mg/kg	<0.02
Dichloropropene, trans-1,3-	mg/kg	<0.02
Dichloropropene, 1,3- (sum of isomers cis + trans)	mg/kg	<0.02
Ethylene Dibromide (Dibromoethane, 1,2-)	mg/kg	<0.02
Hexane (n-Hexane)	mg/kg	<0.02
Methyl Ethyl Ketone (MEK)	mg/kg	<0.5
Methyl Isobutyl Ketone (MIBK)	mg/kg	<0.5
Methyl tert-butyl ether (MTBE)	mg/kg	<0.05
Methylene Chloride (Dichloromethane)	mg/kg	<0.05
Styrene	mg/kg	<0.05
Tetrachloroethane, 1,1,1,2-	mg/kg	<0.02
Tetrachloroethane, 1,1,2,2-	mg/kg	<0.05
Tetrachloroethene (PCE)	mg/kg	<0.05
Trichlorobenzene, 1,2,4	mg/kg	<0.05
Trichloroethane, 1,1,1-	mg/kg	<0.02
Trichloroethane, 1,1,2-	mg/kg	<0.02
Trichloroethene (TCE)	mg/kg	<0.05
Trichlorofluoromethane (Freon 11)	mg/kg	<0.02
Vinyl chloride	mg/kg	<0.02

Table 2
Summary of Maximum Groundwater Concentrations
555 Booth Street, Ottawa, Ontario

Project #R.082784.002

Parameter	Units	Maximum Concentration
BTEX		
Benzene	µg/L	<0.5
Ethylbenzene	µg/L	<0.5
Toluene	µg/L	<0.5
Xylene, o-	µg/L	<0.1
Xylene, m/p-	µg/L	<0.4
Xylenes, Total	µg/L	<0.4
Petroleum Hydrocarbons		
PHC F1 (C6-C10 range) minus BTEX	µg/L	<10
PHC F2 (>C10-C16 range)	µg/L	<50
PHC F3 (>C16-C34 range)	µg/L	<400
PHC F4 (>C34-C50 range)	µg/L	<400
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	µg/L	0.25
Acenaphthylene	µg/L	0.76
Anthracene	µg/L	1.11
Benzo(a)anthracene	µg/L	3.68
Benzo(a)pyrene	µg/L	3.85
Benzo(b)fluoranthene	µg/L	5.47
Benzo(g,h,i)perylene	µg/L	2.62
Benzo(k)fluoranthene	µg/L	1.89
Biphenyl, 1,1-	µg/L	<0.3
Bis(2-chloroethyl)ether	µg/L	<0.3
Bis(2-chloroisopropyl)ether	µg/L	<0.3
Bis(2-ethylhexyl) Phthalate	µg/L	44
Chloroaniline, 4-	µg/L	<0.3
Chlorophenol, 2-	µg/L	<0.3
Chrysene	µg/L	3.86
Dibenzo(a,h)anthracene	µg/L	0.57
Dichlorobenzidine, 3,3'-	µg/L	<0.7
Dichlorophenol, 2,4-	µg/L	<0.3
Diethyl Phthalate	µg/L	<1
Dimethylphenol, 2,4-	µg/L	<1
Dimethyl Phthalate	µg/L	<1
Dinitrophenol, 2,4-	µg/L	<1
Dinitrotoluene, 2,4-	µg/L	<0.3
Fluoranthene	µg/L	7.21
Fluorene	µg/L	0.42
Indeno(1,2,3-cd)pyrene	µg/L	2.86
Methylnaphthalene, 1-	µg/L	0.08
Methylnaphthalene, 2-	µg/L	0.07
Naphthalene	µg/L	0.09
Pentachlorophenol	µg/L	<0.3
Phenanthrene	µg/L	4.15
Phenol	µg/L	<0.1
Pyrene	µg/L	6.34
Trichlorobenzene, 1,2,4-	µg/L	<0.3
Trichlorophenol, 2,4,5-	µg/L	<0.3
Trichlorophenol, 2,4,6-	µg/L	<0.3

Continued on next page

Table 2
Summary of Maximum Groundwater Concentrations
555 Booth Street, Ottawa, Ontario

Project #R.082784.002

Parameter	Units	Maximum Concentration
Metals		
Antimony	µg/L	1.8
Arsenic	µg/L	1.8
Barium	µg/L	959
Beryllium	µg/L	<0.1
Boron	µg/L	205
Cadmium	µg/L	1.20
Chromium (Total)	µg/L	<2
Chromium (Hexavalent)	µg/L	<2
Cobalt	µg/L	11.0
Copper	µg/L	20
Lead	µg/L	1.84
Mercury	µg/L	<1
Molybdenum	µg/L	391
Nickel	µg/L	20
Selenium	µg/L	10
Silver	µg/L	0.17
Thallium	µg/L	0.52
Uranium	µg/L	9.20
Vanadium	µg/L	4.8
Zinc	µg/L	126
Volatile Organic Compounds		
Acetone	µg/L	<2
Bromodichloromethane	µg/L	<0.1
Bromoform (Tribromomethane)	µg/L	<0.1
Bromomethane (Methyl bromide)	µg/L	<0.3
Carbon Tetrachloride (Tetrachloromethane)	µg/L	<0.2
Chlorobenzene (Monochlorobenzene)	µg/L	<0.2
Chloroform (Trichloromethane)	µg/L	2.8
Dibromochloromethane	µg/L	<0.01
Dichlorobenzene, 1,2-	µg/L	<0.01
Dichlorobenzene, 1,3-	µg/L	<0.01
Dichlorobenzene, 1,4-	µg/L	<0.2
Dichlorodifluoromethane (Freon 12)	µg/L	<1
Dichloroethane, 1,1-	µg/L	<0.1
Dichloroethane, 1,2-	µg/L	<0.1
Dichloroethene, 1,1-	µg/L	<0.1
Dichloroethene, cis-1,2-	µg/L	<0.1
Dichloroethene, trans-1,2-	µg/L	<0.1
Dichloropropane, 1,2-	µg/L	<0.1
Dichloropropene, cis-1,3-	µg/L	<0.1
Dichloropropene, trans-1,3-	µg/L	<0.1
Dichloropropene, 1,3- (sum of isomers cis + trans)	µg/L	<0.1
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/L	<0.1
Hexane (n-Hexane)	µg/L	<1
Methyl Ethyl Ketone (MEK)	µg/L	<1
Methyl Isobutyl Ketone (MIBK)	µg/L	<1
Methyl tert-butyl ether (MTBE)	µg/L	<1
Methylene Chloride (Dichloromethane)	µg/L	<0.3
Styrene	µg/L	<0.5
Tetrachloroethane, 1,1,1,2-	µg/L	<0.1
Tetrachloroethane, 1,1,2,2-	µg/L	<0.4
Tetrachloroethene (PCE)	µg/L	<0.2
Trichloroethane, 1,1,1-	µg/L	<0.1
Trichloroethane, 1,1,2-	µg/L	<0.1
Trichloroethene (TCE)	µg/L	<0.01
Trichlorofluoromethane (Freon 11)	µg/L	<0.01
Vinyl chloride	µg/L	<0.2

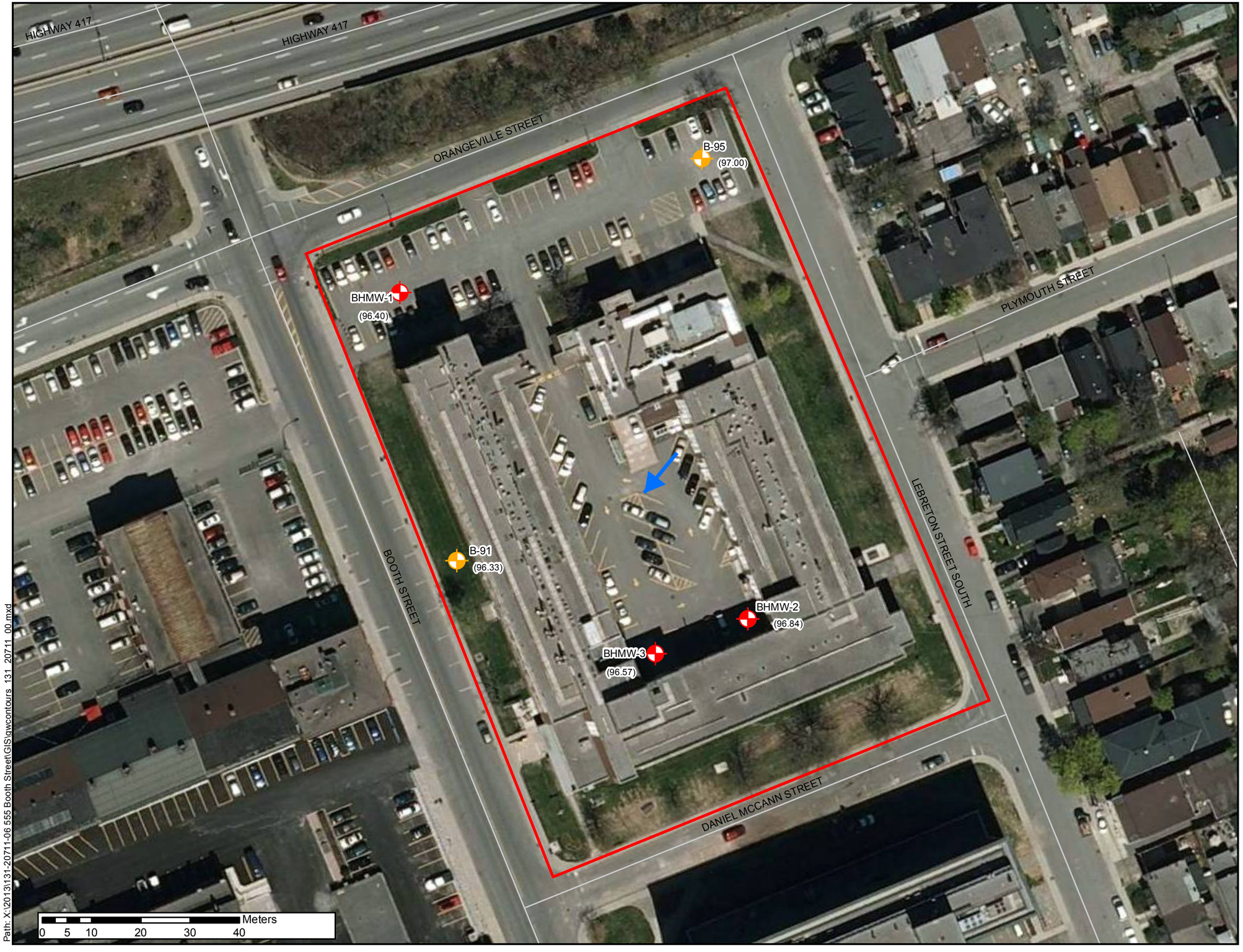
Project # R.082784.002
Table 3:
Summary of Groundwater Monitoring (October 7 and 13, 2016)
555 Booth Street, Ottawa, Ontario

Location	Total Depth of Well (m bgs)	Total Organic Vapour Concentration (ppb)	Liquid Petroleum Hydrocarbon or Sheen (mm)	Groundwater Level (m btoc)	Well Condition
B-91	6.08	230	None	2.08	Good
B-95	6.75	3	None	2.35	Good
BHMW-1	4.39	112	None	2.10	Good
BHMW-2	4.47	300	None	2.12	Good
BHMW-3	4.20	255	None	2.15	Good

Notes:

m btoc = metres below top of casing
m bgs = metres below ground surface

EXCERPTS FROM: LIMITED PHASE II ESA, 555 BOOTH ST., OTTAWA, ON, WSP GROUP. JANUARY 2014.



Path: X:\2013\131-20711-06 555 Booth Street\GIS\gwcontours 131 20711 00.mxd

LEGEND

- SITE BOUNDARY
- BOREHOLE/MONITORING WELL (WSP, DECEMBER 2013)
- MONITORING WELL INSTALLED BY OTHERS (PRE-2013)
- (97.00) GROUNDWATER ELEVATIONS FROM DECEMBER 27, 2013
- INFERRED GROUNDWATER FLOW DIRECTION

Note: Groundwater elevations are relative to an assumed elevation of 100.00 m for the ground surface at the southeast corner of thecourtyard entrance, south of the gate opening.

Figure No. 2	N
Scale	1:750
Drawn By	GR/CD
Job No.	131-20711-06
Date	JANUARY 2014

PROJECT

LIMITED PHASE II ESA
555 BOOTH STREET,
OTTAWA, ONTARIO

TITLE

SITE PLAN AND INFERRED GROUNDWATER FLOW DIRECTION

WSP
2611 QUEENSVIEW DRIVE, SUITE 300
OTTAWA ONTARIO
CANADA K2B 8K2
PHONE: 613-829-2800 FAX: 613-829-2899
WWW.WSPGROUP.COM

BOREHOLE DRILLING RECORD : **BHMW-1**

Prepared by: **Kathryn Maton** Date (Start): **12/21/2013**
Reviewed by: **Vahid Arasteh** Date (End): **12/21/2013**

Project Name: **LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT**
Site: **BOOTH STREET COMPLEX**
Sector: **555 BOOTH STREET, OTTAWA, ONTARIO**
Client: **NRCAN**

Project Number: **131-20711-06**
Geographic Coordinates: X = 444712 mE, Y = 5028001 mN
Surface Elevation: 98.315 m *(Relative)*

Drilling Company: George Downing Drilling Ltd.
Drilling Equipment: CME 55
Drilling Method: Hollow Stem Auger / Carottier NQ
Borehole Diameter: 200 mm
Drilling Fluid: Water
Sampling Method: Split Spoon

ODOUR: F - Light; M - Medium; P - Persistent
VISUAL: D - Disseminated Product; S - Saturated with Product
SAMPLE TYPE: DC - Diamond Corer; SS - Split Spoon; MA - Manual Auger; TR - Trowel; ST - Shelby Tube; TU - DT32 Liner
CHEMICAL ANALYSIS: PHC F1-F4 Petroleum Hydrocarbons F1-F4; BTEX Benzene, Toluene, Ethylbenzene, Xylene; SVOC Semi Volatile Organic Compounds; PAH Polyaromatic Hydrocarbons; ICP-MS Metals; pH
Water Level ▽ Free Phase ▼

An assumed elevation of 100.00 m is used for the southeast corner of the courtyard entrance, south of the gate opening.

DEPTH ELEVATION (m)	LITHOLOGY	DESCRIPTION	VAPOR CONC. (ppm OR % LIE)	ODOUR (F M P)	VISUAL (D S)	SAMPLE TYPE	% RECUPERATION	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	MONITORING WELL DIAGRAM	MONITORING WELL DESCRIPTION	REMARKS
		Ground surface.												
0.05														
0.15		CRUSHED STONE with sand (fill)												
0.25		ASPHALT	0			SS	50	14 17 7	BHMW-1 SS1	BTEX PHC F1-F4 SVOCs ICP-MS Metals PAH				Water level at 1.92 mbgs on December 27, 2013
98.07		SAND, compact, dry, brown (fill)												
0.5		SAND, silty with gravel, dense, dry, dark brown (fill)	0			SS	33	30 26 50-5"	BHMW-1 SS2				Bentonite	
0.91														
1.04		Stone fragments												
97.28		Bedrock (limestone)												
1.5														
2.0														Groundwater sample submitted for laboratory analysis of PHCs, BTEX, VOCs, ICP-MS Metals, PAHs and SVOCs on December 28, 2013
2.5													PVC Slotted Pipe	
3.0													SCREEN Diam. : 51 mm Open. : 0.25 mm Length : 3.05 m	
3.5													WATER Depth : 1.92 m Elev. : 96.40 m Date : 12/27/2013	
4.0														
4.5													Sand	
4.59														
93.73		End of borehole at 4.59 m.												
5.0														

Projet : BH LOGS - 555BOOTH STREET.GPJ Type rapport : GENIVAR-WELL-ENGLISH Data Template : GENIVAR_TEMPLATE_GEOTECH.GDT 1/21/2014

BOREHOLE DRILLING RECORD : **BHMW-2**

Prepared by: **Kathryn Maton** Date (Start): **12/21/2013**
Reviewed by: **Vahid Arasteh** Date (End): **12/21/2013**

Project Name: **LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT**
Site: **BOOTH STREET COMPLEX**
Sector: **555 BOOTH STREET, OTTAWA, ONTARIO**
Client: **NRCAN**

Project Number: **131-20711-06**
Geographic Coordinates: X = 444770 mE, Y = 5027945 mN
Surface Elevation: 99.964 m *(Relative)*

Drilling Company: George Downing Drilling Ltd.
Drilling Equipment: CME 55
Drilling Method: Hollow Stem Auger / Carottier NQ
Borehole Diameter: 200 mm
Drilling Fluid: Water
Sampling Method: Split Spoon

ODOUR: F - Light; M - Medium; P - Persistent
VISUAL: D - Disseminated Product; S - Saturated with Product
SAMPLE TYPE: DC - Diamond Corer; SS - Split Spoon; MA - Manual Auger; TR - Trowel; ST - Shelby Tube; TU - DT32 Liner
CHEMICAL ANALYSIS: PHC F1-F4 Petroleum Hydrocarbons F1-F4; BTEX Benzene, Toluene, Ethylbenzene, Xylene; SVOC Semi Volatile Organic Compounds; PAH Polycyclic Aromatic Hydrocarbons / Polyaromatic Hydrocarbons; ICP-MS Metals; pH
Water Level ▽ Free Phase ▼

An assumed elevation of 100.00 m is used for the southeast corner of the courtyard entrance, south of the gate opening.

DEPTH / ELEVATION (m)	LITHOLOGY	DESCRIPTION	VAPOR CONC. (ppm OR % LIE)	ODOUR F	ODOUR M	ODOUR P	VISUAL D	VISUAL S	SAMPLE TYPE	% RECUPERATION	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	MONITORING WELL DIAGRAM	MONITORING WELL DESCRIPTION	REMARKS
		Ground surface.															
0.05 / 99.91		ASPHALT															
0.15 / 99.81		CRUSHED STONE, with sand (fill)	0						SS	50	55 38 44	BHMW-2 SS1	PHC F1-F4 ICP-MS Metals BTEX/VOC PAH SVOCs				Water level at 3.12 mbgs on December 27, 2013
		SAND, silty with crushed stone, compact to very dense, dry, dark brown (fill) *pieces of brick veneer and glass*	0						SS	62	6 4 6 6	BHMW-2 SS2				Bentonite	
1.22 / 98.74																	
1.37 / 98.59		GRAVEL (fill)	0						SS	25	4 6 23 46	BHMW-2 SS3A					
		SAND, with crushed stone, compact, moist, dark brown (fill)	0									BHMW-2 SS3B	PHC F1-F4 ICP-MS Metals BTEX/VOC PAH SVOCs	DUP1			
1.72 / 98.24		BEDROCK (limestone)														Sand; SCREEN; Diam. : 51 mm; Open. : 0.25 mm; Length : 3.05 m; WATER Depth : 3.12 m Elev. : 96.84 m Date : 12/27/2013	Groundwater sample submitted for laboratory analysis of PHCs, BTEX, VOCs, ICP-MS Metals, PAHs and SVOCs on December 28, 2013
4.64 / 95.32		End of borehole at 4.64 m.														PVC Slotted Pipe	

BOREHOLE DRILLING RECORD : **BHMW-3**

Prepared by: **Kathryn Maton** Date (Start): **12/21/2013**
Reviewed by: **Vahid Arasteh** Date (End): **12/21/2013**

Project Name: **LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT**
Site: **BOOTH STREET COMPLEX**
Sector: **555 BOOTH STREET, OTTAWA, ONTARIO**
Client: **NRCAN**

Project Number: **131-20711-06**
Geographic Coordinates: X = 444757 mE, Y = 5027931 mN
Surface Elevation: 99.913 m *(Relative)*

Drilling Company: George Downing Drilling Ltd.
Drilling Equipment: CME 55
Drilling Method: Hollow Stem Auger / Carottier NQ
Borehole Diameter: 200 mm
Drilling Fluid: Water
Sampling Method: Split Spoon

ODOUR: F - Light; M - Medium; P - Persistent
VISUAL: D - Disseminated Product; S - Saturated with Product

SAMPLE TYPE: DC - Diamond Corer; SS - Split Spoon; MA - Manual Auger; TR - Trowel; ST - Shelby Tube; TU - DT32 Liner

CHEMICAL ANALYSIS: PHC F1-F4 Petroleum Hydrocarbons F1-F4; BTEX Benzene, Toluene, Ethylbenzene, Xylene; SVOC Semi Volatile Organic Compounds; PAH Polycyclic Aromatic Hydrocarbons / Polyaromatic Hydrocarbons; ICP-MS Metals; pH

▽ Water Level ▼ Free Phase

An assumed elevation of 100.00 m is used for the southeast corner of the courtyard entrance, south of the gate opening.

DEPTH ELEVATION (m)	LITHOLOGY	DESCRIPTION	VAPOR CONC. (ppm OR % LIE)	ODOUR F	ODOUR M	ODOUR P	VISUAL D	VISUAL S	SAMPLE TYPE	% RECUPERATION	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	MONITORING WELL DIAGRAM	MONITORING WELL DESCRIPTION	REMARKS
		Ground surface.															
0.05 0.15 *99.76*		ASPHALT															
		CRUSHED STONE	5						SS	46	36 40 24	BHMW-3 SS1	BTEX/VOC ICP-MS Metals PAH SVOCs PHC F1-F4			Bentonite	Water level at 3.45 mbgs on December 27, 2013
0.61 *99.30*		SAND, silty with crushed stone, compact, wet, dark brown (fill) *with brick fragments*	10						SS	8	10 8 6 7	BHMW-3 SS2					
		SAND, silty with crushed stone, compact, wet, dark brown (fill)	0						SS	50	4 4 2 12	BHMW-3 SS3	BTEX/VOC ICP-MS Metals PAH SVOCs PHC F1-F4			Sand	
1.47 *98.44*		BEDROCK (limestone)														SCREEN Diam. : 51 mm Open. : 0.25 mm Length : 3.05 m WATER Depth : 3.22 m Elev. : 96.46 m Date : 12/27/2013	
4.31 *95.60*		End of borehole at 4.31 m.														PVC Slotted Pipe	Groundwater sample submitted for laboratory analysis of PHCs, BTEX, VOCs, ICP-MS Metals, PAHs and SVOCs on December 28, 2013

Projet : BH LOGS - 555BOOTH STREET.GPJ Type rapport : GENIVAR-WELL-ENGLISH Data Template : GENIVAR_TEMPLATE_GEOTECH.GDT 1/21/2014

EXCERPTS FROM: SOIL AND GROUNDWATER SAMPLING AT 555 BOOTH ST., OTTAWA, ONTARIO. FINAL REPORT. STANTEC. AUGUST 24, 2015.

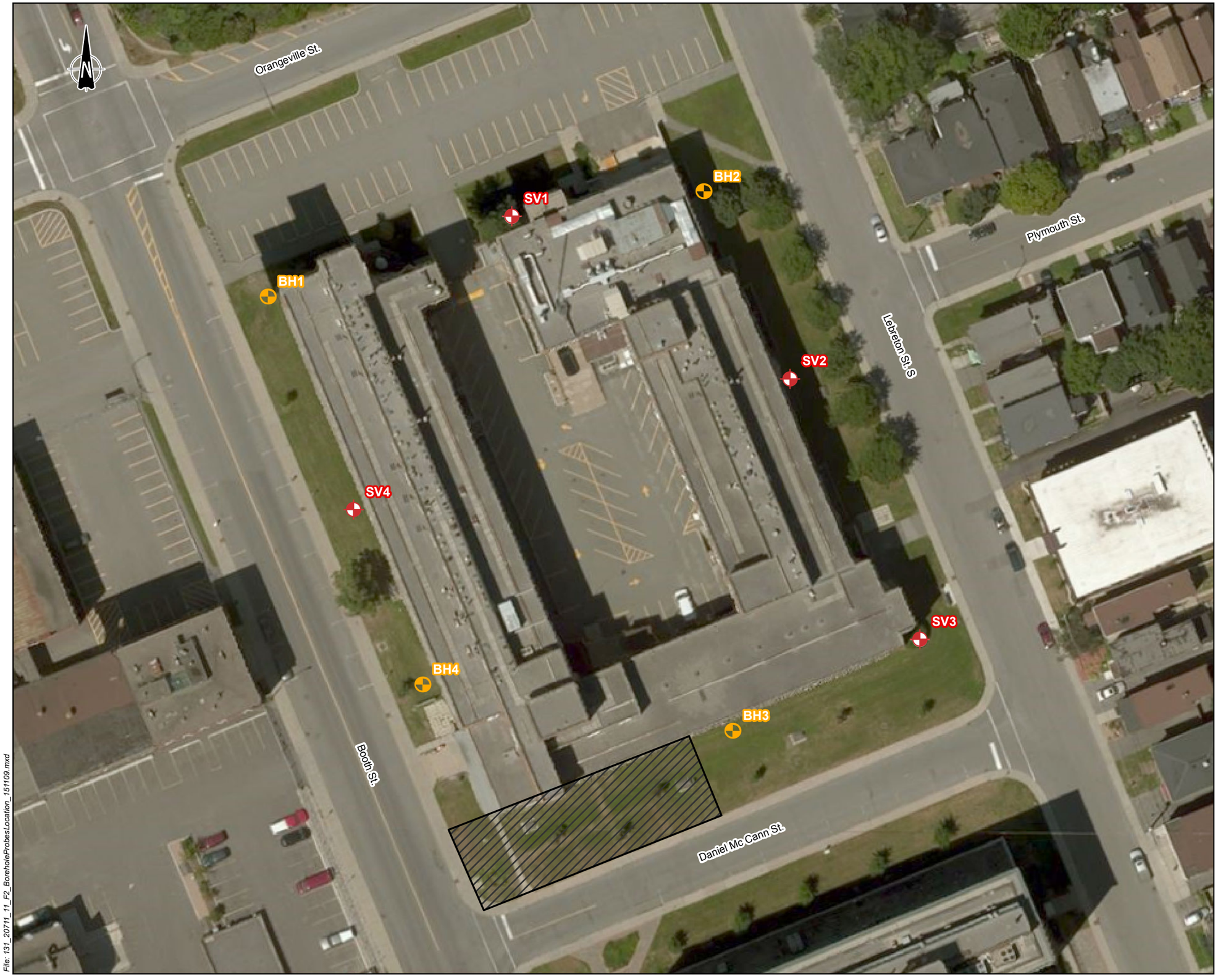
Table 1
Summary of Soil Analytical Results - Soil Classification Results
555 Booth Street, Ottawa, ON
PWGSC

Sample Location			Stockpile
Sample Date			05-June-15
Sample ID			555 Booth St
Sampling Company			STANTEC
Laboratory			PARACEL
Laboratory Work Order			1523367
Laboratory Sample ID	Units	MOECC O.Reg. 347	1523367-01
Physical Characteristics			
% Solids	0.1% by wt	NV	88.8
Flashpoint	°C	NV	>70
TCLP - Leachate Inorganics			
Arsenic	mg/L	2.5	<0.05
Barium	mg/L	100	0.55
Boron	mg/L	500	0.05
Cadmium	mg/L	0.5	<0.01
Chromium	mg/L	5	<0.05
Lead	mg/L	5	<0.05
Mercury	N/A	0.1	<0.005
Selenium	mg/L	1	<0.05
Silver	mg/L	5	<0.05
Uranium	mg/L	10	<0.05
Fluoride	mg/L	150	0.12
Nitrate as N	mg/L	1000	<1
Nitrite as N	mg/L		<1
Cyanide, free	mg/L	20	<0.02
TCLP - Leachate Organics			
Benzene	mg/L	0.5	<0.005
Carbon Tetrachloride	mg/L	0.5	<0.005
Chlorobenzene	mg/L	8	<0.004
Chloroform	mg/L	10	<0.006
1,2-Dichlorobenzene	mg/L	20	<0.004
1,4-Dichlorobenzene	mg/L	0.5	<0.004
1,2-Dichlorothane	mg/L	0.5	<0.005
1,1-Dichloroethylene	mg/L	1.4	<0.006
Methyl Ethyl Ketone (2-Butanone)	mg/L	200	<0.30
Methylene Chloride	mg/L	5	<0.04
Tetrachloroethylene	mg/L	3	<0.005
Trichloroethylene	mg/L	5	<0.004
Vinyl Chloride	mg/L	0.2	<0.005
Benzo [a] pyrene	mg/L	0.001	<0.0001
PCBs			
Leachable Total PCB	mg/L	0.3	<0.003
Petroleum Hydrocarbons			
TPH (gasoline)	ug/g	NV	<10
TPH (diesel)	ug/g	NV	<10
TPH (heavy oil)	ug/g	NV	<50

Notes:

MOECC - Ontario Ministry of the Environment and Climate Change
O.Reg. 347 - MOECC O.Reg. 347 of R.R.O. 1990 - Schedule 4 - Leachate Quality Criteria
NV - No standards/guideline value

EXCERPTS FROM: GEOTECHNICAL SURVEY REPORT – DRAFT REPORT, 555 BOOTH STREET, OTTAWA, ONTARIO. WSP/GENIVAR. JANUARY 17, 2014.



Soil sampling borehole

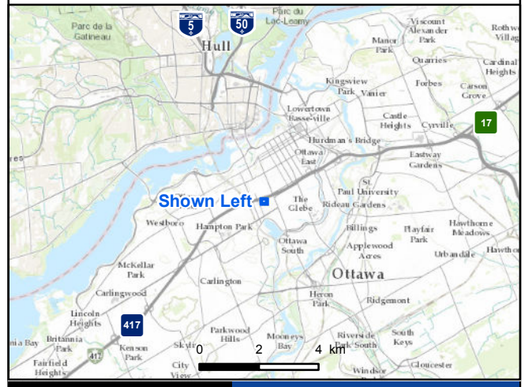
Soil sampling borehole and installed vapour probe

Heating plant location (approximate)

0 7.5 15 30 m

1 : 600

Projection: NAD83, UTM 18N



NATURAL RESOURCES CANADA

SOIL/SOIL VAPOUR MONITORING

555, Booth Street
Ottawa, On

Figure 2

Boreholes and soil vapour probes locations

Source:
Aerial photography : Bing Maps Aerial
Map : ESRI World topographic Map

Preparation: M. Rochon
Drawing: I. Douce
Verification : M. Rochon

January 29th, 2016 131-20711-11

WSP

File: 131_20711_11_F2_BoreholeProbesLocation_151109.mxd

BOREHOLE DRILLING RECORD : **BH1**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **Northwest corner**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.40307423 °W
Y = -75.70645682 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

▽ Water Level ▼ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	GEOLOGY / LITHOLOGY: LITHOLOGY	GEOLOGY / LITHOLOGY: DESCRIPTION	OBSERVATIONS: VAPOR CONC. (ppm OR % LIE)	OBSERVATIONS: ODOUR (F M P)	OBSERVATIONS: VISUAL (D S)	SAMPLES: SAMPLE TYPE	SAMPLES: % RECUPERATION	SAMPLES: N (Blow/6")	SAMPLES: NUMBER	SAMPLES: ANALYSIS	SAMPLES: DUPLICATE	MONITORING WELL: DIAGRAM	MONITORING WELL: DESCRIPTION	REMARKS
		Ground surface.												
0.05		Topsoil	<1			TU	75		BH1 TU1					
		Fill: Silty sand with traces of gravel, moist, brown	<1						BH1 TU2	VOC PAH				
0.5														0.5
0.65		Refusal on bedrock at 0.65 mbgs												
0.70		End of borehole at 0.65 m.												
1.0														1.0

BOREHOLE DRILLING RECORD : **BH2**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **Northeast corner**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.4032338 °W
Y = -75.70555166 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

▽ Water Level ▼ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	GEOLOGY / LITHOLOGY: LITHOLOGY	GEOLOGY / LITHOLOGY: DESCRIPTION	OBSERVATIONS: VAPOR CONC. (ppm OR % LIE)	OBSERVATIONS: ODOUR (F M P)	OBSERVATIONS: VISUAL (D S)	SAMPLES: SAMPLE TYPE	SAMPLES: % RECUPERATION	SAMPLES: N (Blow/6")	SAMPLES: NUMBER	SAMPLES: ANALYSIS	SAMPLES: DUPLICATE	MONITORING WELL: DIAGRAM	MONITORING WELL: DESCRIPTION	REMARKS
		Ground surface.												
0.05		Topsoil	<1			TU	75		BH2 TU1					
		Fill: Sand with traces of gravel, moist, brown												
			<1						BH2 TU2					
0.5			<1						BH2 TU3	VOC PAH				0.5
1.0														1.0
			<1			TU	85		BH2 TU4					
1.5		*1.5 to 1.8 mbgs : Greyish color, larger gravel fragments*												1.5
			<1						BH2 TU5	VOC PAH	BH2-TU5-D			
2.0														2.0
2.15														
2.20		Refusal on bedrock at 2.15 mbgs												
		End of borehole at 2.15 m.												
2.5														2.5
3.0														3.0

BOREHOLE DRILLING RECORD : **BH3**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **South side**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.40244386 °W
Y = -75.70548155 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

▽ Water Level ▼ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	GEOLOGY / LITHOLOGY: LITHOLOGY	GEOLOGY / LITHOLOGY: DESCRIPTION	OBSERVATIONS: VAPOR CONC. (ppm OR % LIE)	OBSERVATIONS: ODOUR (F M P)	OBSERVATIONS: VISUAL (D S)	SAMPLES: SAMPLE TYPE	SAMPLES: % RECUPERATION	SAMPLES: N (Blow/6")	SAMPLES: NUMBER	SAMPLES: ANALYSIS	SAMPLES: DUPLICATE	MONITORING WELL: DIAGRAM	MONITORING WELL: DESCRIPTION	REMARKS
		Ground surface.												
		Topsoil	<1			TU	75		BH3 TU1					
0.05		Fill: Sand with traces of gravel, moist, brown												
			<1						BH3 TU2	VOC PAH				
0.5														0.5
0.90		Refusal on bedrock at 0.90 mbgs												
0.95		End of borehole at 0.90 m.												
1.0														1.0

Projet : 131-20711-11-100-LOGS.GPJ Type rapport : WSP_EN_WELL-ENVIRONMENTAL Data Template : WSP_TEMPLATE_GEOTECH.GDT 2016-1-26

BOREHOLE DRILLING RECORD : **BH4**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **West side**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.40250763 °W
Y = -75.70612743 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

▽ Water Level ▼ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	GEOLOGY / LITHOLOGY: LITHOLOGY	GEOLOGY / LITHOLOGY: DESCRIPTION	OBSERVATIONS: VAPOR CONC. (ppm OR % LIE)	OBSERVATIONS: ODOUR (F M P)	OBSERVATIONS: VISUAL (D S)	SAMPLES: SAMPLE TYPE	SAMPLES: % RECUPERATION	SAMPLES: N (Blow/6")	SAMPLES: NUMBER	SAMPLES: ANALYSIS	SAMPLES: DUPLICATE	MONITORING WELL: DIAGRAM	MONITORING WELL: DESCRIPTION	REMARKS
		Ground surface.												
0.05		Topsoil	<1			TU	75		BH4 TU1	VOC PAH				
		Fill: Sand with traces of gravel, moist, brown	<1						BH4 TU2					
0.5														0.5
0.95		Refusal on bedrock at 0.95 mbgs												
1.00		End of borehole at 0.95 m.												1.0

Projet : 131-20711-11-100-LOGS.GPJ Type rapport : WSP_EN_WELL-ENVIRONMENTAL Data Template : WSP_TEMPLATE_GEOTECH.GDT 2016-1-26

MONITORING WELL DRILLING RECORD : **SV1**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **North**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.4031949 °W
Y = -75.70595074 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

Water Level ▽ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	LITHOLOGY	DESCRIPTION	VAPOR CONC. (ppm OR % LIE)	ODOUR F	ODOUR M	ODOUR P	VISUAL D	VISUAL S	SAMPLE TYPE	% RECUPERATION	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		Ground surface.															
0.05		Topsoil	<1						TU	100		SV1 TU1				Jplug type well cap Flush Mount Casing	
		Fill: Sand with some gravel, moist, brown	<1									SV1 TU2				25 mm diameter PCV riser Bentonite	
			<1									SV1 TU3	VOC PAH	SV1-TU3-D			
1.20																Silica sand 25 mm diameter PVC screen, 0.3 m length Bottom cap	
1.25		Refusal on bedrock at 1.2 mbgs															
		End of borehole at 1.20 m.															

0.5
1.0
1.5
2.0

MONITORING WELL DRILLING RECORD : **SV2**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **East side**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.40296033 °W
Y = -75.70536918 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

▽ Water Level ▼ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	LITHOLOGY	DESCRIPTION	VAPOR CONC. (ppm OR % LIE)	ODOUR F	ODOUR M	ODOUR P	VISUAL D	VISUAL S	SAMPLE TYPE	% RECUPERATION	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		Ground surface.															
0.05		Topsoil	<1						TU	75		SV2 TU1				Jplug type well cap	
		Fill: Sand with traces of gravel, moist, brown	<1									SV2 TU2		SV2-TU2-D		Flush Mount Casing	
0.5			<1									SV2 TU3				25 mm diameter PVC riser	0.5
1.0																Bentonite	1.0
1.5			<1						TU	75		SV2 TU4	VOC PAH				1.5
2.0																Silica sand 25 mm diameter PVC screen, 0.3 m length Bottom cap	2.0
2.15																	
2.20		Refusal on bedrock at 2.15 mbgs End of borehole at 2.15 m.															
2.5																	2.5
3.0																	3.0

MONITORING WELL DRILLING RECORD : **SV3**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **Southeast corner**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.40257989 °W
Y = -75.70509435 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

▽ Water Level ▼ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	LITHOLOGY	DESCRIPTION	VAPOR CONC. (ppm OR % LIE)	ODOUR F	ODOUR M	ODOUR P	VISUAL D	VISUAL S	SAMPLE TYPE	% RECUPERATION	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		Ground surface.															
0.05		Topsoil	<1						TU	75		SV3 TU1				Jplug type well cap	
		Fill: Silty sand with traces of gravel, moist, brown														Flush Mount Casing	
			<1									SV3 TU2				25 mm diameter PVC riser	
0.60		Fill: Silty sand with traces of coal, moist, dark brown	<1									SV3 TU3	VOC PAH			Bentonite	
1.20		Fill: Silty sand with traces of gravel, moist, brown	<1						TU	85		SV3 TU4				Silica sand	
																25 mm diameter PVC screen, 0.3 m length	
1.55																Bottom cap	
1.60		Refusal on bedrock at 1.55 mbgs															
		End of borehole at 1.55 m.															

0.5 1.0 1.5 2.0

MONITORING WELL DRILLING RECORD : **SV4**

Prepared by: **Shannon Picard** Date (Start): **2015-12-01**
Reviewed by: **Matthieu Rochon** Date (End): **2015-12-01**

Project Name: **Soil sampling and Soil vapour probe installation**
Site: **555 Booth Street, Ottawa, ON**
Sector: **West side**
Client: **Natural Resources Canada**

Project Number: **131-20711-11-100**
Geographic Coordinates: X = 45.40276296 °W
Y = -75.7062747 °N
Surface Elevation: m *()*
Top of PVC Elevation:

Drilling Company: Forage Liégeois
Drilling Equipment: Géoprobe 6620DT
Drilling Method: Hydraulic Percussion
Borehole Diameter: 100 mm
Drilling Fluid:
Sampling Method: DT32 Liner

ODOUR
F - Light
M - Medium
P - Persistent

VISUAL
D - Disseminated Product
S - Saturated with Product

SAMPLE TYPE
DC - Diamond Corer
SS - Split Spoon
MA - Manual Auger
TR - Trowel
ST - Shelby Tube
TU - DT32 Liner

Water Level ▽ Free Phase

CHEMICAL ANALYSIS

PCB	Poly-Chlorinated Biphenyls	MAH	Monocyclic Aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, Xylene	PAH	Polycyclic Aromatic Hydrocarbons
Inorg. C.	Inorganic Compounds	PH C_{10}-C_{50}	Petroleum Hydrocarbons C_{10}-C_{50}
Phenol. C.	Phenolic Compounds	PH F1-F4	Petroleum Hydrocarbons F1-F4 (C_{10}-C_{50})
VOC	Volatil Organic Compounds (MAH & CAH)	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Zinc.
Diox. & Fur.	Dioxins & Furans	HWR	Leacheate Tests (Haz. Waste Reg.)
CAH	Chlorinated Aliphatic Hydrocarbons		

DEPTH *ELEVATION* (m)	LITHOLOGY	DESCRIPTION	VAPOR CONC. (ppm OR % LIE)	ODOUR F	ODOUR M	ODOUR P	VISUAL D	VISUAL S	SAMPLE TYPE	% RECUPERATION	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		Ground surface.															
0.05		Topsoil	<1						TU	80		SV4 TU1					
		Fill: Silty sand with traces of gravel, moist, brown	<1									SV4 TU2	VOC PAH				
			<1									SV4 TU3					
1.20																	
1.25		Refusal on bedrock at 1.2 mbgs															
		End of borehole at 1.20 m.															

Jplug type well cap
Flush Mount Casing
25 mm diameter PCV riser
Bentonite
Silica sand
25 mm diameter PVC screen, 0.3 m length
Bottom cap

0.5
1.0
1.5
2.0

Projet : 131-20711-11-100-LOGS.GPJ Type rapport : WSP_EN_WELL-ENVIRONMENTAL Data Template : WSP_TEMPLATE_GEOTECH.GDT 2016-1-26

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 93 43.01 – Tree Pruning.

1.2 REFERENCES

.1 Definitions:

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

.2 Drip-line of Trees: means the ground surface directly beneath tips of outermost branches, which shall not be less than 3.0 metres radius from the trunk or may be larger as designated by the Departmental Representative.

.3 Critical Root Zone of Trees (CRZ): means the zone under a tree where there should be no disturbance before, during, and after construction. The CRZ is established as being 10 centimetres from the trunk of a tree for every centimetre of trunk diameter. The protected zone may be larger as designated by the Departmental Representative.

.2 Reference Standards:

.1 ASTM International

.1 ASTM A1064/A1064M-13, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 CSA Group

.1 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Fertilizers Act (R.S. 1985, c. F-10).

.3 Fertilizers Regulations (C.R.C., c. 666).

.4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.4 Health Canada - Pest Management Regulatory Agency (PMRA)

.1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

.2 Submit monthly written reports on health condition of plant material during warranty period, to Departmental Representative identifying:

.1 Development and condition of plant material.

.2 Preventative or corrective measures required which are outside Contractor's responsibility.

.3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect tree and shrub preservation materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Develop Construction Waste Management Plan related to Work of this Section.

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

Part 2 Products

2.1 MATERIALS

.1 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded minimum particle size: 5 mm.

.2 Fertilizer:

.1 To Canada Fertilizer Act and Fertilizers Regulations.

.2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.

.3 Anti-desiccant: commercial, wax-like emulsion.

.4 Steel Stakes: 38 x 89 x 2400 mm length T-bars; stakes shall be straight.

.5 Welded wire fabric (WWF): 100 x 100mm or with openings of maximum 150mm.

Part 3 Execution

3.1 IDENTIFICATION AND PROTECTION

.1 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.

.2 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved Departmental Representative.

.3 Soil compaction within the drip-line / CRZ of a tree shall be avoided at all times, unless otherwise agreed to in advance by the Departmental Representative. Placement of plywood, metal decks, sand, etc. will be considered prior to authorizing heavy equipment within the unprotected drip-line of all trees in this project.

.4 Equipment shall not be allowed to operate, park, be repaired, or refueled inside a protected root zone; nor shall construction materials be stored or any earth materials be stockpiled within the protected root zone.

.5 Barrier for vegetation protection:

.1 To protect trees and shrubs in lawn areas or planting beds that are to remain the Contractor shall drive steel stakes vertically 1.2m into ground, spaced maximum 3.0m apart. The welded wire fabric shall be stretched between posts to prevent sag.

.2 The welded wire fabric shall be erected to provide a continuous barricade between designated vegetation and the work area prior to construction.

.3 The welded wire fabric shall be placed at the critical root zone of the trees, unless inadequate to provide a 1.5m buffer zone between the fence and limit of construction. With the permission of the Departmental Representative, the fence may be placed within the drip-line of the tree to provide the required buffer zone of 1.5m but in no case less than 1m from the outer circumference to the trunk of the tree.

.4 When the trunk of trees are less than 4.5m apart, the trees shall be considered a woodlot and the barrier shall be place so it forms a continuous barricade around the woodlot as specified in the Contract Documents.

.6 Vegetation protection measures shall be maintained erect and in good repair at all times during construction operations, and shall be removed upon completion when agreed by the Departmental Representative. Temporary removal of barricades will be considered only after reviewing the requirements with the Departmental Representative.

3.2 PRUNING

.1 Prune in accordance with Section 32 93 43.01 - Tree Pruning.

3.3 ANTI-DESICCANT

.1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

3.4 CLEANING

.1 Upon completion remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavating, Trenching and Backfilling

1.2 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS.MUNI 1010 – Materials Specifications for Aggregates – Base, Subbase, Select Subgrade and Backfill Materials.

.2 LS -602, Sieve Analysis of Aggregates, MTO Laboratory Testing Manual

.2 American Society for Testing Materials (ASTM) International

.1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 2 Products

2.1 MATERIALS

.1 Granular sub-base material: Granular B Type I material in accordance with OPSS.MUNI 1010 – Materials Specifications for Aggregates – Base, Subbase, Select Subgrade and Backfill Materials.

.2 Submit materials test data to Departmental Representative for review a minimum of 4 days prior to use in project.

Part 3 Execution

3.1 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated from subgrade to underside of aggregate base courses.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.7 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.9 Remove and replace portion of layer in which material has become segregated during spreading.

.10 Ensure compaction is tested using Nuclear Density Gauge to verify its compliance prior to placing next lift.

3.2 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density of not less than 100% standard proctor maximum dry density in accordance with ASTM D698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compaction to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 PROOF ROLLING

.1 Use industry standard equipment to proof roll the subgrade prior to placing Granular sub-base.

.2 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.3 Where proof rolling reveals areas of defective subgrade:

.1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with sub-base material and compact in accordance with this section.

.3 Replace sub-base material and compact.

.4 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.4 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.5 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavating, Trenching and Backfilling

1.2 REFERENCES

.1 Ontario Provincial Standards Specifications (OPSS)

.1 OPSS.MUNI 1010 – Materials Specifications for Aggregates – Base, Subbase, Select Subgrade and Backfill Materials.

.2 LS -602, Sieve Analysis of Aggregates, MTO Laboratory Testing Manual

.2 American Society for Testing Materials (ASTM) International

.1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 2 Products

2.1 MATERIALS

.1 Granular base course: Granular A material in accordance with OPSS.MUNI 1010 – Materials Specifications for Aggregates – Base, Subbase, Select Subgrade and Backfill Materials.

.2 Submit materials test data to Departmental Representative for review at least 4 days prior to use in project.

Part 3 Execution

3.1 PLACEMENT AND INSTALLATION

.1 Place granular base course after sub-base surface is inspected and approved in writing by Departmental Representative.

.2 Placing:

.1 Construct granular base course to depth and grade in areas indicated from subbase to underside of asphalt.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Place material using methods which do not lead to segregation or degradation of aggregate.

.5 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.4 Compacting:

.1 Compact to density not less than 100% standard proctor maximum dry density to ASTM D698.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.2 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.3 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 17 23 – Pavement Markings.

1.2 REFERENCES

.1 Ontario Provincial Standards Specifications (OPSS)

- .1 OPSS 1101 – Materials Specification for Performance Graded Asphalt Cement.
- .2 OPSS 1003 – Materials Specification for Aggregates.
- .3 OPSS 1103 – Materials Specification for Emulsified Asphalt.
- .4 OPSS 1150 – Material Specification for Hot Mix Asphalt.
- .5 OPSS 310 – Construction Specification for Hot Mix Asphalt.

.2 ASSHTO R29-2

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Test and Evaluation Reports:

- .1 Submit manufacturer's test data and certification that asphalt cement meets specification requirements.
- .2 Submit manufacturer's test data and certification that hydrated lime meets specified requirements.
- .3 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for approval at least one week prior to beginning Work.
- .4 Submit printed record of mix temperatures at end of each week.

1.4 DELIVERY, STORAGE AND HANDLING

.1 No stockpiling of materials allowed on Site.

Part 2 Products

2.1 MATERIALS

.1 Performance graded asphalt cement: in accordance with OPSS 1101, grade PG 58 when tested to ASSHTO R29-2.

.2 Reclaimed Asphalt Product: in accordance with OPSS 1003.

.3 Tack Coat: in accordance with OPSS 1103.

.4 Aggregates: in accordance with OPSS 1003.

.5 Type HL3 Hot Mix Asphalt: in accordance with OPSS 1150.

.6 Type HL8 Hot Mix Asphalt: in accordance with OPSS 1150.

2.2 EQUIPMENT

.1 In accordance with OPSS 310, Clause 310.06 Equipment.

2.3 MIX DESIGN

.1 Mix design to be approved in writing by Departmental Representative.

.2 Mix design to be developed by testing laboratory certified by Canadian Council of Independent Laboratories (CCIL).

.3 Design of mix: to meet requirements of OPSS 1150, Type HL3 and Type HL8. 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.

2.4 PLANT AND MIXING REQUIREMENTS

.1 Production procedure to meet the requirements of OPSS 1150, Clause 1150.07.

2.5 PREPARATION

.1 Prior to laying mix, clean surfaces of loose and foreign material.

2.6 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required.

.1 Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.

.3 Schedule delivery of material for placing in daylight.

.4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.

.1 Do not dribble mix into trucks.

.5 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.6 Deliver loads continuously in covered vehicles and immediately spread and compact.

.1 Deliver and place mixes at temperature within range as directed by Departmental Representative, but not less than 135 degrees C.

2.7 PLACING

.1 Obtain Departmental Representative's approval of base prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as indicated.

.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5 degrees C minimum.

.2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as follows:

.1 Base course 50 mm

.2 Surface course 40 mm

.5 Spread and strike off mixture with self propelled mechanical finisher.

.1 Construct longitudinal joints and edges true to line markings.

.1 Departmental Representative to establish lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.

.2 Maintain constant head of mix in auger chamber of paver during placing.

.3 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.4 Correct irregularities in alignment left by paver by trimming directly behind machine.

.5 Correct irregularities in surface of pavement course directly behind paver.

.1 Remove excess material forming high spots using shovel or lute.

.1 Fill and smooth indented areas with hot mix.

.2 Do not broadcast material over such areas.

.6 Do not throw surplus material on freshly screeded surfaces.

.6 When hand spreading is used:

.1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section.

.1 Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly without broad casting material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes.

.1 Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straight edges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt.

.1 Control temperature to avoid burning material.

.2 Do not use tools at higher temperature than temperature of mix being placed.

2.8 COMPACTING

.1 Roll asphalt continuously to density not less than 92% and not more than 96.5% of Maximum Relative Density, tested using Calibrated Nuclear Density Gauge.

.2 General:

.1 Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.

.4 Use static compaction for levelling coarse less than 25 mm thick.

.5 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.6 Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.

.7 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.8 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.9 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.10 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.1 Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.11 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.12 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.13 Do not change rolling pattern unless mix changes or lift thickness changes.

2.9 JOINTS

.1 General:

.1 Remove surplus material from surface of previously laid strip.

.1 Do not deposit on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 600 mm.

.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150 mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.

.1 If cold joint can not be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.

.3 Overlap previously laid strip with spreader by 25 to 50 mm.

.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.

.5 Roll longitudinal joints directly behind paving operation.

.6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.

2.10 FINISH TOLERANCES

.1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.

.3 Reinstate pavement markings in accordance with Section 32 17 23 – Pavement Markings.

2.11 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.

.1 If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.

.2 Repair areas showing checking, rippling, or segregation.

.3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 REFERENCES

.1 ASTM International

.1 ASTM C136-13, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.2 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Colored Concrete.

.2 CSA Group

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.

.3 CSA A231.1/A231.2-06(R2010), Precast Concrete Paving Slabs/Precast Concrete Pavers.

.4 CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

.3 Shop Drawings:

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

.2 Indicate on drawings layout, pattern and relationship of paving joints to fixtures and project formed details.

.4 Samples:

.1 Submit full size sample of each type, size pavers.

.5 Test and Evaluation Reports:

.1 Submit following sampling and testing data:

.1 Sieve analysis for gradation of bedding and joint material.

.2 Unit paver sampling and testing.

.3 Evaluation of cleaning compound.

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

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

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in precast concrete paver installations.

.2 Mock-ups:

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Construct 3 x 3 m area mock-up.

.3 Mock-up will be used:

.1 To judge quality of work, substrate preparation, operation of equipment and material application.

.2 To determine surcharge of bedding layer, joint sizes, lines, laying patterns, colours and texture.

.3 Locate where directed.

.4 Allow 24 hours for inspection of mock-up before proceeding with work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

.6 Obtain approval of mock-up in writing from Departmental Representative prior to proceeding.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect precast concrete units from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 CONCRETE PAVERS

.1 Concrete pavers: to CSA A23.1/A23.2 and as follows:

.1 Size: 60 mm x 100 mm x 200 mm height.

.2 Laying Pattern: Herringbone with single soldier course at the periphery.

.3 Colour: brown, variations to homogenous pattern acceptable to Departmental Representative.

.4 Standard end, corner, border units as required.

.2 Manufactured in moulds, with spacers, suitable for installation and delivered on site in cubes of laying panels, in protective wrapping.

.3 Pigment in concrete pavers: to ASTM C979/C979M.

2.2 BEDDING AND JOINT MATERIAL

.1 Determine bedding sand hardness as follows:

.1 Randomly select single 1.4 kg sample from sand source.

.2 Dry sample for 24 hours at 115 degrees C to 121 degrees C.

.3 Obtain 3 sub-samples each weighing 0.2 kg by passing original sample several times through riffle box.

.4 Carry out sieve analysis test on each sub-sample in accordance with CSA A23.1/A23.2.

.2 Remix each sub-sample and place in nominal litre capacity porcelain jar with two 2 25 mm diameter steel ball bearings weighing 75 +/-5 g each. Rotate each jar at 50 rpm for six 6 hours. Repeat sieve analysis. Record individual and average sieve analysis.

.3 For each sample tested, maximum increase in percentages passing each sieve and maximum individual percent passing is in accordance with table as follows:

Sieve Size	Maximum Increase	Maximum Passing
0.075 mm	2%	2%
0.150 mm	5%	15%
0.300 mm	5%	35%

.4 Bedding and joint sand: clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock or gravel. Do not use limestone screenings or stone dust.

.5 Gradation: to CSA A23.1/A23.2, Table 4 - Grading Limits for Fine Aggregate, and CAN/CSA-A179 as follows:

Sieve Designation	% Passing for Bedding Sand	Joint Sand
10 mm	100	
5 mm	95-100	100
2.5 mm	80-100	95-100
1.25 mm	50-90	60-100
630 microns	25-65	
600 microns	35-80	
315 microns	10-35	
300 microns	15-20	
160 microns	2-10	
150 microns	2-15	

2.3 EDGE RESTRAINTS

.1 Edge restraints shall be steel.

2.4 CLEANING COMPOUND

.1 Clear, organic solvent, designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.

.2 Acid based chemical detergent, designed and recommended by manufacturer for removal of contamination encountered on pavers.

2.5 SEALING COMPOUND

.1 Clear acrylic urethane, exterior type, water based, specially formulated for application on precast concrete pavers.

.2 Clear, solvent based acrylic, exterior type, containing co-polymer specially formulated for application on precast concrete pavers.

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 STRUCTURAL SURFACE

.1 Verify that structural surfaces conform to levels and compaction required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3 m straightedge.

.3 Ensure that structural surface is not frozen or standing water is present during installation.

3.3 STRUCTURAL CURBS

.1 Verify that structural curbs conform to elevations and alignments required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative

3.4 INSTALLATION OF EDGE RESTRAINTS

.1 Install restraints true to grade, in accordance with manufacturer's recommendations.

3.5 PLACING OF BEDDING MATERIAL

.1 Bedding material shall not be saturated or frozen at any time until installation is complete.

.2 Spread and screed material on structural surface to achieve 25 mm compacted thickness after vibrating pavers in place. Do not use joint sand for bedding sand.

.3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

3.6 INSTALLATION OF CONCRETE PAVERS

.1 Lay pavers to patterns indicated. Joints between pavers: 5 mm wide.

.2 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures.

.3 Installation by mechanical equipment:

- .1 Prepare installation sequence and obtain approval of sequence by Departmental Representative.
- .2 Place paver pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.
- .3 Run equipment approved for installation only on paving surfaces vibrated in place.
- .4 Complete installation or after placing each 5 m width of installation.
- .5 Inspect pavers and remove chipped, broken or otherwise damaged pavers if structural performance or aesthetics is adversely compromised Departmental Representative.
- .6 Replace pavers removed without altering layout and structural quality.

.4 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.

.5 Inspect, remove, and replace chipped, broken and damaged pavers.

.6 Sweep dry joint sand material into joints.

.7 Settle sand by vibrating pavers with plate compactor.

.8 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.

.9 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.

.10 Sweep off excess joint material when installation is complete.

.11 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.

.12 Final surface elevations not to exceed plus or minus 10 mm under 3 m long straightedge.

.13 Surface elevation of pavers: 3 to 4 mm above adjacent drainage inlets, concrete collars or channels.

.14 Ensure conformance of final elevations.

3.7 PRECAST CONCRETE UNIT CLEANING

.1 Carry out cleaning at times and conditions recommended by manufacturer of cleaning compound, immediately prior to sealing and as directed by Departmental Representative.

.2 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.

.3 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.

.4 Final surface to be free of contamination.

3.8 SEALING

.1 Ensure paver surfaces to be sealed are clean, free of extraneous materials and efflorescence, dry and appropriately cured.

.2 Apply 1 coats sealer in accordance with manufacturer's recommendations.

.3 Protect sealed surfaces from trespass until sealer has dried and hardened.

3.9 FIELD QUALITY CONTROL

.1 Retain concrete testing laboratory accredited in accordance with CSA A283.

.2 Sample and test in accordance CSA A23.1/A23.2.

.3 Do sampling and testing once for each 5,000 square metres of material on site, as directed by Departmental Representative.

.4 Departmental Representative will select 10 pavers for testing from material on site for each sampling.

.5 Submit test results to Departmental Representative for approval of precast concrete pavers.

3.10 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 20 00 – Concrete Reinforcing.

.2 Section 03 30 00 – Cast-in-Place Concrete.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

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

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

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

.3 ASTM D698-07ae1, 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-3.3-2007, Kerosene, Amend. No. 1, National Standard of Canada.

.2 CAN/CGSB-8.2-88, Sieves, Testing, Woven Wire, Metric Series.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS.

.3 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.

.4 If materials have been tested by an accredited testing laboratory within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Joint filler, Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.4 Granular base: material to following requirements:

.1 Granular A and Granular B Type I in accordance with OPSS.MUNI 1010

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

.6 Fill material: to following requirements:

.1 Select Subgrade Material in accordance with OPSS.MUNI 1010

.7 Boiled linseed oil: to ASTM D260.

.8 Kerosene: to CAN/CGSB-3.3.

.9 Caulking: Use two-component polysulphide sealant to CGSB 19-GP-24m, Type 1, Class B. Provide sample for approval.

Part 3 Execution

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

.1 Dispose of surplus and unsuitable excavated material in approved location off site.

.3 Place fill in maximum 300 mm layers and compact to at least 100 % of maximum dry density to ASTM D698.

3.2 GRANULAR BASE

.1 Obtain 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 100 % of maximum density to ASTM D698.

3.3 CONCRETE

.1 Obtain Departmental Representative’s approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

3.4 TOLERANCES

.1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 3.0 m.

.2 Install expansion joints at intervals of 6 m.

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

3.6 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.

.2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.8 BACKFILL

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

.2 Backfill to designated elevations with material as indicated.

3.9 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS 710 – Construction Specification for Pavement Markings

.2 OPSS 1716 – Material Specifications for Water-Borne Traffic Paint

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Samples:

.1 Submit to Departmental Representative following material sample quantities at least 2 weeks prior to commencing work.

.1 1 L sample of yellow traffic (MTO) paint in accordance with OPSS1710.

.2 Certificate of Compliance from the manufacturer indicating that the physical properties and chemical composition shall conform to this specification.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:

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

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Paint and Markings:

.1 To be in accordance with OPSS 1710 except that glass beads shall not be required. Colour: to yellow in accordance with OPSS 1710.

.2 Upon request, Departmental Representative will supply qualified product list of paints applicable to work. Qualified paints may be used but Departmental Representative reserves right to perform further tests.

.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 are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.

.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 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 TRAFFIC CONTROL

.1 In accordance with Section 01 35 00.06 – Special Procedures for Traffic Control.

3.4 APPLICATION

.1 Pavement markings: lay out as per Existing Conditions as indicated on Drawings.

.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 in accordance with OPSS 710

.4 Do not thin paint unless approved by Departmental Representative.

.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.

3.5 TOLERANCE

.1 Paint markings: within plus or minus 12 mm of dimensions indicated.

.2 Remove incorrect markings.

3.6 PROTECTION

.1 Protect pavement markings until dry.

.2 Repair damage to adjacent materials caused by pavement marking application.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 PAYMENT

.1 Testing of topsoil: Contractor will pay for cost of tests as specified in Section 01 45 00 – Quality Control.

1.3 REFERENCES

.1 Agriculture and Agri-Food Canada

.1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment

.1 PN1340-2005, Guidelines for Compost Quality.

1.4 DEFINITIONS

.1 Compost:

.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.

.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.

.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 50), and contain no toxic or growth inhibiting contaminates.

.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

.2 Friable: Soil, which is easily crumbled through fingers when held by hand.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality control submittals:

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

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

1.6 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

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

Part 2 Products

2.1 TOPSOIL

.1 Topsoil for **planting beds**: variable mixture of sand, silt, clay, organic material and nutrients.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 45 to 70% sand, maximum 35% silt,14 to 20% clay, and contain minimum 4% organic matter by weight.

.2 Final acidity value shall range from pH 6.0 to 7.5 for trees and shrubs.

.3 Contain no toxic elements or growth inhibiting materials.

.4 Finished surface free from:

.1 Debris and stones over 50 mm diameter.

.2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.5 Consistence: friable when moist.

.2 Topsoil for **sodded areas**: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of maximum 70% sand, and contain 2 to 5% organic matter by weight.

.2 Final acidity value shall range from pH 5.5 to 7.5 for turfgrasses and be capable of sustaining vigorous plant growth.

.3 Contain no toxic elements or growth inhibiting materials.

.4 Finished surface free from:

.1 Debris and stones over 50 mm diameter.

.2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.3 Man-made materials (including glass, plastic, and asphalt).

.5 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:

.1 Fertility: major soil nutrients present in following amounts:

.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.6 Ph value: 6.5 to 8.0.

.2 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to coarse textured.

.4 Organic matter: unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Limestone:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.6 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

.1 Advise Departmental Representative of sources of topsoil to be utilized and provide results of tests prior to placement of topsoil.

.2 Contractor is responsible for amendments to supply topsoil as specified.

.3 Soil testing by recognized testing facility for sand, silt, clay pH, P and K, and organic matter. Topsoil shall be approved by Departmental Representative prior to bringing any topsoil on site.

.4 Testing of topsoil will be carried out by testing laboratory.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures as indicated Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

3.2 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

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

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.3 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Departmental Representative has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil to following minimum depths after settlement.

.1 150 mm for seeded areas.

.2 150 mm for sodded areas.

.3 300 mm for flower beds.

.4 500 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.4 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.

.1 Leave surfaces smooth, uniform and firm against deep foot printing.

3.5 ACCEPTANCE

.1 Departmental Representative will inspect topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.6 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required off site.

3.7 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 91 19.13 – Topsoil Placement and Grading.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

.3 Samples.

.1 Submit:

.1 Sod for each type specified.

.1 Install approved samples in 1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.

.2 Obtain approval of samples by Departmental Representative.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

.5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

.6 Submit WHMIS MSDS – Material Safety Data Sheets, in accordance with Section 01 35 29.14 – Health and Safety for Contaminated Sites.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Replace defective or damaged materials with new.

1.5 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.14 – Health and Safety for Contaminated Sites.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 MATERIALS

.1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.

.1 Turf Grass Nursery Sod types:

.1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars

.2 Number One Named Cultivars: Nursery Sod grown from certified seed.

.2 Turf Grass Nursery Sod quality:

.1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.

.2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.

.3 Mowing height limit: 35 to 65 mm.

.4 Soil portion of sod: 6 to 15 mm in thickness.

.2 Sod establishment support:

.1 Wooden pegs: 17 x 8 x 200 mm.

.3 Water:

.1 Potable

2.2 SOURCE QUALITY CONTROL

.1 Obtain written approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

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

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Fine grade surface free of humps and hollows to smooth, even grade, elevations indicated, for surface to drain naturally.

.4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

3.3 SOD PLACEMENT

.1 Ensure sod placement is done under the supervision of a certified Landscape Professional with an Horticultural degree or diploma from a provincially accredited Institution.

.2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.4 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.4 SOD PLACEMENT ON SLOPES AND PEGGING

.1 Start laying sod at bottom of slopes.

.2 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:

- .1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.
- .2 Not less than 3-6 pegs per square metre.
- .3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Departmental Representative.

.4 Drive pegs to 20 mm above soil surface of sod sections.

3.5 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.

.3 Maintain sodded areas weed free 95%.

.4 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.7 ACCEPTANCE

.1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:

.1 Sodded areas are properly established.

.2 Sod is free of bare and dead spots.

.3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.

.4 Sodded areas have been cut minimum 2 times prior to acceptance with a minimum of 2 weeks between each cut.

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

.3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 91 19.13 – Topsoil Placement and Grading.

.2 Section 32 93 43.01 – Tree Pruning.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada (AAFC).

.1 Plant Hardiness Zones in Canada (2000).

.2 Canadian Nursery Landscape Association (CNLA).

.1 Canadian Standards for Nursery Stock-2001.

.3 Departmental of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots for plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 SUBMITTALS

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

.2 Submit manufacturer's instructions, printed product literature and data sheets including product characteristics, performance criteria, physical size, and limitations for:

.1 Anti-desiccant.

.2 Guying assembly including clamps, collar, guying wire, anchors and wire tightener.

.3 Mulch.

.3 Submit 2 copies of WHMIS MSDS – Material Safety Data Sheets, in accordance with Section 01 35 29.14 – Health and Safety for Contaminated Sites.

.4 Submit samples for:

.1 Mulch.

1.5 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.14 – Health and Safety for Contaminated Sites.

1.6 STORAGE AND PROTECTION

.1 Protect plant material from frost, excessive heat, wind and sun during delivery.

.2 Immediately store and protect plant material which will not be installed within 1 hour after arrival at site in storage location approved by Departmental Representative.

.3 Protect plant material from damage during transportation:

.1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, use enclosed vehicle where practical.

.2 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.

.4 Protect stored plant material from frost, wind and sun and as follows:

.1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.

.2 For pots and containers, maintain moisture level in containers.

.3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zone.

.5 Store and manage hazardous materials in accordance with manufacturer's written instructions.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

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

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

.4 Dispose of unused anti-desiccant at official hazardous material collections site approved by Departmental Representative.

.5 Divert unused wood and mulch materials from landfill to composting facility.

1.8 SCHEDULING

.1 Obtain approval from Departmental Representative of schedule 7 days in advance of shipment of plant material.

.2 Schedule to include:

.1 Quantity and type of plant material.

.2 Shipping dates.

.3 Arrival dates on site.

.4 Planting dates.

1.9 WARRANTY

.1 The Contractor hereby warrants that plant material as itemized on plant list indicated on the contract drawings will remain **free of defects for 12 months** from the date of substantial completion.

.2 End-of-warranty inspection will be conducted by Departmental Representative.

Part 2 Products

2.1 PLANT MATERIAL

.1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.

.2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

.3 Trees: with straight trunks, well and characteristically branched for species except where specified otherwise.

.4 Substitutions to the plant material as indicated on the Drawing L200 – Landscape Reinstatement Plan are not permitted unless prior written approval of the Departmental Representative has been obtained regarding type, variety, and size. Plant substitutions must be of similar species and of equal or greater size than those originally specified. No additional costs will be entertained for substituted plant material.

2.2 WATER

.1 Potable and free of impurities that would inhibit plant growth.

2.3 STAKES

.1 T-bar, steel, 40 x 40 x 5 x 2440 mm wood, pointed one end, 38 x 38 x 2300 mm.

2.4 WIRE TIGHTENER

.1 Type 1: galvanized steel.

.2 Type 2: turnbuckle, galvanized steel, 9.5 mm diameter with 270 mm open length.

2.5 GUYING WIRE

.1 Type 1: steel, 3 mm wire.

.2 Type 2: 1.5 mm diameter multi-wire steel cable.

.3 Type 3: 3 mm diameter multi-wire steel cable.

2.6 GUYING COLLAR

.1 Tube: plastic, 13 mm diameter, nylon reinforced.

2.7 TRUNK PROTECTION

.1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fastener.

.2 Plastic: perforated drainage pipe.

2.8 MULCH

.1 Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

.2 Shredded wood: varying in size from 25 to 125 mm in length, from coniferous trees.

2.9 ANTI-DESICCANT

.1 Wax-like emulsion.

2.10 SOURCE QUALITY CONTROL

.1 Obtain approval from Departmental Representative of plant material prior to planting.

.2 Plant material is considered acceptable when it is structurally sound, conforms to species growth characteristics, is well furnished with living foliage, has normal colour, shows adequate annual growth and formation of buds and free from disease, insect infestations, rodent damage, sunscald, frost cracks and other abrasions or scars to the bark.

.3 Plant material that does not meet the condition described above shall be considered unacceptable. Plant materials which are unacceptable shall be rejected by the Departmental Representative. Rejected plant material shall be replaced by the contractor within five business days.

Part 3 Execution

3.1 PRE-PLANTING PREPARATION

.1 Ensure plant material acceptable to Departmental Representative.

.2 Remove damaged roots and branches from plant material.

.3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

.4 Locate and protect underground utilities during construction.

.5 Notify and acquire written acknowledgment from utility authorities before beginning excavation of planting pits for trees and shrubs.

.6 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures in accordance with Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 Preparation of planting beds is specified in Section 32 91 19.13 - Topsoil Placement and Grading

.2 For individual planting holes:

.1 Stake out location as per planting plan and obtain approval from Departmental Representative prior to excavating.

.2 Excavate to depth and width as indicated.

.3 Remove subsoil, rocks, roots, debris and toxic material. Dispose off site.

.4 Scarify sides of planting hole.

.5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.3 PLANTING

.1 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball. Do not pull burlap or rope from under root ball.

.2 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.

.3 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.

.4 For trees and shrubs:

.1 Backfill soil in 150 mm lifts. Lightly tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.

.2 Form watering saucer as indicated.

.5 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.

.6 Water plant material thoroughly.

.7 After soil settlement has occurred, fill with soil to finish grade.

.8 Dispose of burlap, wire and container material off site.

3.4 TRUNK PROTECTION

.1 Install trunk protection on deciduous trees as indicated to prevent rodent damage.

.2 Install trunk protection prior to installation of tree supports when used.

.3 Ensure the base of the trunk protections rest on the ground, and there is continuous contact with the ground. Trunk protection base to be covered with 50mm of mulch.

3.5 TREE SUPPORTS

.1 Install tree supports as indicated on Drawing L300 – Landscape Details.

.2 Use tree support for deciduous trees and evergreens.

.1 Place stake on prevailing wind side and 150 mm from trunk.

.2 Drive stake minimum 150 mm into undisturbed soil beneath roots. Ensure stake is secure, vertical and unsplit.

.3 Install 150 mm long guying collar 1500 mm above grade.

.4 Thread Type 1 guying wire through guying collar tube. Twist wire to form collar and secure firmly to stake. Cut off excess wire.

.3 After tree supports have been installed, remove broken branches with clean, sharp tools

3.6 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 Spread mulch as indicated.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following maintenance operations from time of planting to contract completion.

.1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.

.1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.

.2 Remove weeds monthly.

.3 Replace or respread damaged, missing or disturbed mulch.

.4 For non-mulched areas, cultivate as required to keep top layer of soil friable.

.5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.

.6 Remove dead or broken branches from plant material.

.7 Keep trunk protection and guy wires in proper repair and adjustment.

.8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.8 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 All conditions of the Contract and Section 01 00 10 – General Instructions apply to this Section.

1.2 REFERENCES

.1 American National Standard Institute (ANSI)

.1 ANSI A300 (Part 1)-2001, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (revision and re-designation of ANSI A300-1995) (includes supplements).

.2 ANSI A300 (Part 2)-1998, Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization.

.3 ANSI A300 (Part 3)-2000, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - Tree Support Systems (a. Cabling, Bracing, and Guying) (supplement to ANSI A300-1995).

.2 Canadian Nursery Landscape Association (CNLA)

.3 International Society of Arboriculture (ISA)

.4 Canada Labour Code, Canada Occupational Safety and Health Regulations.

.5 Ontario Ministry of Labour, Occupational Health and Safety Act (OHSA).

.1 Publication, Chain Saw Safety.

.6 Ontario Ministry of Agriculture, Food and Rural Affairs

.1 Publication 483-2004, Pruning Ornamentals.

1.3 DEFINITIONS

.1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.

.2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.

.3 Crown Raising: consists of removal of lower tree branches to provide clearance.

.4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.

.5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.

.6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.4 SUBMITTALS

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

.2 Submit WHMIS MSDS – Material Safety Data Sheets, in accordance with Section 01 35 29.14 – Health and Safety for Contaminated Sites.

1.5 QUALITY ASSURANCE

.1 Certification:

.1 Provide International Society of Arboriculture certification.

.2 Chain saw operator to be fully trained in all aspects of operating a chain saw and in full compliance of all health and safety regulations of the Ministry of Labour's Occupational Health and Safety Code.

.2 Regulatory requirements: provide safety certificate as approved by local hydro utility.

.3 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:

.1 Knowledge of target areas including branch bark ridge and branch collars.

.2 Technique for selection process and pruning used to establish desired form and shape for each species.

.4 Acceptance of Work will be determined by Departmental Representative from field sample.

.5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.14 - Health and Safety for Contaminated Sites.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

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

.3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.

.4 Ensure emptied containers are sealed and stored safely.

.5 Divert wood materials from landfill to facility for recycling / composting as directed by Departmental Representative.

1.7 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.

.2 Disinfect tools before each tree is pruned.

.3 On diseased plant material disinfect tools before each cut.

Part 2 Products

2.1 DISINFECTANT

.1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

Part 3 Execution

3.1 APPLICATION

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

3.2 GENERAL

.1 Prune in accordance with Pruning Ornamentals, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.

.2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.

.3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.

.4 Prune each species when in full leaf.

.5 Retain natural form and shape of plant species.

.6 Do not:

- .1 Flush cut branches.
- .2 Crush or tear bark.
- .3 Cut behind branch bark ridge.
- .4 Damage branch collars.
- .5 Damage branches to remain.

3.3 PRUNING

.1 Remove dead, dying, diseased and weak growth from plant material to provide crown cleaning, crown restoration, and as directed by Departmental Representative in order to promote healthy growth.

.2 Remove live branches that:

- .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
- .2 Are of weak structure including narrow crotches.
- .3 Obstruct development of more important branches.
- .4 Are broken.

.3 Remove live branches to re-establish natural species form including:

- .1 One or more developing leaders.
- .2 Multiple growth due to previous topping.
- .3 Branches extending outward from natural form.
- .4 Undesirable sucker growth.

.4 Remove loose branches, twigs and other debris lodged in tree.

.5 Remove vines.

.6 For branches under 50 mm in diameter:

.1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.

.2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.

.3 Do not cut lead branches unless directed by Departmental Representative.

.7 For branches greater than 50 mm in diameter:

.1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.

.2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.

.3 Make final cut adjacent to and outside branch collar.

.8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.

.1 Repair areas which are damaged, or remove damaged area back to next branch collar.

.9 Remove additional growth designated by Departmental Representative.

3.4 CARE OF WOUNDS

.1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.5 CLEANING

.1 Collect and dispose of compost/recycle whenever applicable pruned material daily and remove from site.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast-in-Place Concrete.

.2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.3 Section 32 12 16 – Asphalt Paving

.4 Section 33 41 00 – Storm and Utility Drainage Piping

1.2 REFERENCES

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

.1 ASTM A48/A48M-03(2012), Standard Specification for Gray Iron Castings.

.2 ASTM C117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM C139-11, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.

.5 ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

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

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA) Group

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A165 Series-04(R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).

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

.4 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.4 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS 310 – Construction Specification for Hot Mix Asphalt

.2 OPSS 407 - Construction Specification for Maintenance Hole, Catch Basin, Ditch Inlet and Valve Chamber Installation

.3 OPSS.MUNI 410 – Construction Specification for Pipe Sewer in Open Cut

.5 Ontario Provincial Standard Drawings (OPSD)

.1 OPSD 509.010 – Pavement Reinstatement for Utility Cuts

.2 OPSD 701.010 – Precast Concrete Maintenance Hole, 1200mm Diameter

.3 OPSD 701.021 – Maintenance Hole Benching and Pipe Openings

.4 OPSD 705.010 – Precast Concrete Catch Basin 600 x 600mm

.5 OPSD 708.030 – Catch Basin Connection for Flexible Main Pipe Sewer

.6 OPSD 802.010 – Flexible Pipe Embedment and Backfill, Earth Excavation

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Contractor to submit shop drawings for all Manhole and Catch Basin structures to Departmental Representative for approval 2 weeks prior to commencement of work.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

.1 Cast-in-place concrete:

.1 In accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Precast maintenance hole units: to OPSD 701.010

.1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

.2 Monolithic bases to be approved by Departmental Representative and set on concrete slabs cast in place.

.3 Precast catch basin sections: as indicated.

.4 Joints: made watertight using rubber rings.

.5 Mortar:

.1 Aggregate: sand.

.2 Masonry Cement: to CAN/CSA-A3002.

.6 Ladder rungs: to CSA G30.18, No.25M billet steel deformed bars, hot dipped galvanized to CAN/CSA-G164.

.1 Rungs to be safety pattern (drop step type).

.7 Adjusting rings: to ASTM C478M.

.8 Concrete Brick: to CAN/CSA-A165 Series.

.9 Drop maintenance hole pipe: same as sewer pipe.

.10 Galvanized iron sheet: approximately 2 mm thick.

.11 Steel gratings, I-beams and fasteners: as indicated.

.12 Frames, gratings, covers to dimensions as indicated and following requirements:

.1 Metal gratings and covers to bear evenly on frames.

.1 Frame with grating or cover to constitute one unit.

.2 Assemble and mark unit components before shipment.

.2 Gray iron castings: to ASTM A48/A48M, strength class 30B.

.3 Castings: sand blasted or cleaned and ground to eliminate surface imperfections.

.4 Maintenance hole frames and covers: as indicated on Drawings.

.5 Catch basin frames and covers: use existing where practical to do so and new frames and covers per details drawings.

.6 Size: 762 mm clear diameter.

.13 Granular bedding and backfill: in accordance with OPSS 1010 per Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.14 Unshrinkable fill: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

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

3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33.01 – Excavating, Trenching, and Backfilling and as indicated.

.2 Obtain approval of Departmental Representative before installing maintenance holes or catch basins.

3.3 CONCRETE WORK

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

3.4 INSTALLATION

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

.2 Complete units as pipe laying progresses.

.1 Maximum of 3 units behind point of pipe laying will be allowed.

.3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.

.4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density.

.5 Precast units:

.1 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination of these materials.

.2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.

.3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.6 For sewers:

.1 Place stub outlets and bulkheads at elevations and in positions indicated.

.2 Benching of Storm Maintenance holes is not required. Sumps required in Storm Maintenance Holes per OPSD 701.010.

.3 Benching of Sanitary Maintenance holes shall be in accordance with OPSS 407 and OPSD 701.021.

.7 Compact granular backfill to 95% standard proctor density.

.8 Place unshrinkable backfill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.9 Installing units in existing systems:

.1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.

.2 Make joints watertight between new unit and existing pipe.

.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.10 Place frame and cover on top section to elevation as indicated.

.1 If adjustment required use concrete ring.

.11 Clean units of debris and foreign materials.

.1 Remove fins and sharp projections.

.2 Prevent debris from entering system.

.12 Install safety platforms in maintenance holes having depth of 5 m or greater, as indicated.

3.5 ADJUSTING TOPS OF EXISTING UNITS

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

.2 Sectional units:

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

.2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.

.1 When amount of raise is less than 600 mm use standard maintenance hole brick, moduloc or grade rings.

.3 Monolithic units:

.1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.

.2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.

.3 When monolithic units with tapered upper section are lowered more than 150 mm, remove concrete for entire depth of taper plus as much straight wall as necessary, then rebuild upper section to required elevation with cast-in-place concrete.

.4 Install additional maintenance hole ladder rungs in adjusted portion of units as required.

.5 Re-use existing gratings, frames and I beams where practical.

3.6 FIELD QUALITY CONTROL

.1 Contractor shall complete a leakage test.

.2 Install watertight plugs or seals on inlets and outlets of each new maintenance hole and fill maintenance hole with water.

.3 Leakage not to exceed 0.3% per hour of volume of maintenance hole.

.4 If permissible leakage is exceeded, correct defects.

.5 Repeat until approved by Departmental Representative.

.6 Departmental Representative will issue Test Certificate for each maintenance hole passing test.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast-in-Place Concrete.

.2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.3 Section 3305 16 – Manholes and Catch Basin Structures

1.2 REFERENCES

.1 American Society for Testing Materials (ASTM) International

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

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

.3 ASTM C443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.4 ASTM C506M-10a, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.

.5 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3(600 kN-m/m^3)).

.6 ASTM D1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.

.7 ASTM D2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.8 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.9 ASTM F794-03(2009), Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-M89, Sieves, Testing, Woven Wire, Inch Series.

.3 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS.MUNI 410 Construction Specification for Pipe Sewer in Open Cut

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

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

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 List of materials and proposed product suppliers

.3 Certificates:

.1 Certification to be marked on pipe.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PLASTIC PIPE

.1 Type PSM Polyvinyl Chloride (PVC): to ASTM D3034.

.1 Standard Dimensional Ratio (SDR): 35.

.2 Locked-in gasket and integral bell system.

.3 Nominal lengths: 6 m.

2.2 SERVICE CONNECTIONS

.1 Type PSM Poly (Vinyl) Chloride: to CSA B182.2.

.2 Plastic pipe: to CSA B182.1, with push-on joints.

2.3 CEMENT MORTAR

.1 Portland cement: to CSA A3000, normal type 10.

.2 Mix mortar 1 part by volume of cement to two parts of clean, sharp sand mixed dry.

.1 Add only sufficient water after mixing to give optimum consistency for placement.

.2 Do not use additives.

2.4 PIPE BEDDING AND SURROUND MATERIALS

.1 Granular material in accordance with following requirements:

.1 OPSS Granular A in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Concrete mixes and materials for cradles, encasement, supports: to Section 03 30 00 - Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

.1 As indicated in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

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 Departmental Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth of 150 mm.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.1 Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95 % maximum density to ASTM D698.

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

3.4 INSTALLATION

.1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.2 Handle pipe in accordance with manufacturers recommendations.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

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

.5 Joint deflection permitted within limits recommended by pipe manufacturer.

.6 Water to flow through pipes during construction only as permitted by Departmental Representative.

.7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Install plastic pipe and fittings in accordance with CSA-B182.11.

.9 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.

.10 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.

.11 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.12 Make watertight connections to manholes and catch basins.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

.13 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.

.1 Joint to be structurally sound and watertight.

.14 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, surround and cover pipes as indicated.

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

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

.5 Compact each layer from pipe invert to mid height of pipe to at least 95 % maximum density to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % maximum density to ASTM D698.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.6 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 95 % maximum density to ASTM D698. In other areas, compact backfill to at least 95 % maximum density to ASTM D698.

3.7 FIELD TESTS AND INSPECTIONS

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

.2 Complete Low Pressure Air testing in accordance with OPSS.MUNI.410

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

.4 Television and photographic inspections:

.1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.

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

.3 Payment for inspection services shall be included in the lump sum price bid.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast-in-Place Concrete.

.2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.3 Section 33 05 16 – Manholes and Catch Basin Structures

1.2 REFERENCES

.1 American Society for Testing Materials (ASTM) International

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

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

.3 ASTM C443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.4 ASTM C506M-10a, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.

.5 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3(600 kN-m/m^3)).

.6 ASTM D1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.

.7 ASTM D2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.8 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.9 ASTM F794-03(2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-M89, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-34.9-94, Asbestos-Cement Sewer Pipe.

1.3 SCHEDULING

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

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submittals to include:

.1 List of materials and proposed materials source(s).

.3 Certification to be marked on pipe.

1.5 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 PLASTIC PIPE

.1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D3034.

.1 Standard Dimensional Ratio (SDR): 35.

.2 Locked-in gasket and integral bell system.

.3 Nominal lengths: 6 m.

2.2 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material in accordance with following requirements:

.1 OPSS Granular A in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

2.3 BACKFILL MATERIAL

.1 As indicated in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

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 Departmental Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth of 150 mm.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.1 Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95 % maximum density to ASTM D698.

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

3.4 INSTALLATION

.1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.2 Handle pipe in accordance with manufacturers recommendations. .

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

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

.5 Joint deflection permitted within limits recommended by pipe manufacturer.

.6 Water to flow through pipes during construction only as permitted by Departmental Representative.

.7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Install plastic pipe and fittings in accordance with CSA-B182.11.

.9 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.

.10 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.

.11 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.12 Make watertight connections to manholes and catch basins.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

.13 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.

.1 Joint to be structurally sound and watertight.

.14 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, surround and cover pipes as indicated.

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

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

.5 Compact each layer from pipe invert to mid height of pipe to at least 95 % maximum density to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % maximum density to ASTM D698.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.6 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 95 % maximum density to ASTM D698. In other areas, compact backfill to at least 95 % maximum density to ASTM D698.

.4 Place unshrinkable backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.7 FIELD TESTS AND INSPECTIONS

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

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

.3 Television and photographic inspections:

.1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.

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

.3 Payment for inspection services shall be included in the lump sum price bid.

END OF SECTION