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## DATA COLLECTION

### A.2.1 Roles and Responsibilities

#### 2.1.1 Consultant's

1. Gather and review all relevant information available from public records and City/MTO/other authority record or as-built drawings including previous studies, investigations, analysis and reports. The Consultant is responsible for gathering all the data from the various City sources and reviewing it for accuracy.
2. Conduct a site review of the project area to determine and confirm existing conditions, and to note changes or omissions to the record or as-built drawings, previous investigations, or reports.
3. Identify and conduct all necessary field reviews, studies, and surveys to suit the project scope.
4. The Consultant will be required to undertake the collection, review, and rationalization of all Source Data Sets.
5. Request, review and rationalize utility records from City and Utility Companies.

#### 2.1.2 City's

6. Provide a general review of submissions (within 3 weeks or less) to confirm compliance with City Standards.
7. Review, comment and approval of the SUE and Geotechnical Proposals within 3 weeks
8. Best efforts will be made by the City to provide access to the following information as it exists at the time of assignment for use and preparing the preliminary design, detailed design and contract administration services; however it is the Consultant's responsibility for collecting this information listed below:
  - (i) List of Key City Contacts (Internal Directory) and annual updates, as needed
  - (ii) Current release of CADD standards (including digital file structure)
  - (iii) Standard Specifications and General Conditions
  - (iv) Historical soil data, if and where applicable
  - (v) Available existing CCTV camera sewer inspection information if and where available
  - (vi) Available water and drain service information
  - (vii) Available existing engineering as-built plan data
  - (viii) Toronto Water Asset GeoDatabase Information
  - (ix) Topographical mapping
  - (x) Available utility mapping
  - (xi) Property data mapping
  - (xii) Survey & mapping specifications and requirements
  - (xiii) Current District Design criteria
  - (xiv) Communication materials to and from the public and stakeholder groups
  - (xv) Aerial mapping

- (xvi) Horizontal and vertical control information
- (xvii) All pertinent reports including EA documents, if available
- (xviii) Standard document templates in Microsoft Word format
- (xix) All legal surveys.

Note: The accuracy of the information is not guaranteed. Therefore, the Consultant shall field verify and confirm all relevant topographic information and existing features.

#### 2.1.3 Field Reviews, Existing Conditions, and Utilities

1. The Consultant shall develop an approach to ensure that critical utilities are maintained during construction. Where necessary, coordinate and arrange to expose if accurate location is critical for design purposes. Cost to expose will be borne by the City.
2. The Consultant shall perform field investigations, including hammer sounding and close-up visual inspections of each component of the structure, including bearings and retaining walls, to ascertain condition and quantities. Prepare a report summarizing these results together with digital photos.
3. The Consultant shall identify upgrades, replacements, or retrofits to existing components required to meet current safety requirements.
4. The Consultant shall investigate, identify, and undertake environmental testing as required of any embedded or exposed ducts in the structure to identify any OSHA-designated substances and to identify the owners of the ducts.
5. The Consultant shall obtain complete information and requirements from all utility companies and stakeholders.

#### 2.1.4 Coordination

- 2.1.4.1 The Consultant must coordinate with the various City's District and Operation Staff to collect various background information.
- 2.1.4.2 The Consultant must coordinate with the Utilities to obtain all relevant records, including circulation of the preliminary base plan.
- 2.1.4.3 The Consultant shall identify all utility appurtenances attached to the substructure and superstructure, or on the ground, within the project limits. The utility owners of these assets are to be notified to determine their relocation requirements, if needed.

#### 2.1.5 Collection and Review of Background Data

- 2.1.5.1 Obtain copies of the CCTV reports for the existing storm and/or sanitary sewers for any Toronto Water assignment that includes sewer replacement, which will provide some information needed for the preliminary designs and detailed designs. This information will be provided to the Consultant, if available. If required, the costs to perform CCTV inspections and produce the associated reports, in the case that they are not available from Toronto Water will be paid from the Provisional Allowance indicated in the RFP.
- 2.1.5.2 Gather and review all relevant information available from public records and City/MTO/Other authority record or as-built drawings including previous studies, investigations, analyses and reports. Review and confirm any existing field information provided by the City and/or other agencies, including topographic and utility system data. The Consultant shall contact the utility companies and obtain all existing and proposed utility information from the utility owners. In addition, the Consultant shall field verify the supplied information, arrange for necessary test pits and confirm utility information and/or conflicts as part of the SUE investigation.

- 2.1.5.3 Mapping Services can provide topographic information accurate to  $\pm 150$  mm, aerial images, parcel mapping and address information for planning and preliminary design purposes, where available. This information is available from Survey and Utility Mapping located at 18 Dyas Rd.
- 2.1.5.4 Not all drawings will be digital and may need to be copied. Consultant will be responsible for obtaining the required documents and producing the copies as needed and integrating any necessary information.
- 2.1.5.5** The Consultant will be required to obtain any additional documentation such as as-built sewer and water service records as part of the data collection. This information may be in various formats from the City archives. The Consultant is responsible for visiting the archives, making the requests, and then gathering any necessary information. The project information is contained at various City locations and the Consultant will be responsible for visiting each location to collect the required as-builts for each assignment. The Consultant shall verify the content of existing data and obtain updated information as necessary. **Any redesign work required due to the Consultant's failure to comply with the above requirements will be at the Consultant's own cost.**

## **A.2.2 Subsurface Utility Engineering**

- 2.2.1 Unless specifically instructed in the Request for Proposal that subsurface utility engineering (SUE) investigations are not required; the successful proponent must retain the services of a specialized firm that will conduct a SUE investigation to the quality level indicated in the RFP. SUE Quality Levels are defined as follows:
1. The scope of work to complete a Quality Level D, as a minimum, must address the following:
    - (i) Records and Information Research - conduct appropriate investigation (e.g. Owner records, City of Toronto archival records, Toronto Public Utilities Coordinating Committee records, personal interviews, visual inspections, etc.) to help identify utility owners that may have facilities within the project limits or that may be affected by the project.
    - (ii) Record Collection - collect applicable records (e.g. utility owner base maps, "as built" or record drawings, permit records, field notes, geographic information system data, oral histories, etc.) on the existence and approximate location of existing involved utilities.
    - (iii) Records Review - review records for evidence or indication of additional available records. For duplicate or conflicting information, provide clarification.
    - (iv) Identification of Aerial or Ground-Mounted Facilities - include records research, identification, and depiction of aerial or ground-mounted facilities in Quality Level 'D' tasks.
    - (v) Compilation and Presentation of Data - transfer information on all involved utilities to appropriate plan sheets, electronic files, and/or other documents as required by the City of Toronto. Exercise professional judgment to resolve conflicting information. For information depicted, indicate; utility type and ownership; date of depiction; quality level (s); end points of any utility data; line status (e.g. active, abandoned, out of service); line size and condition; number of jointly buried cables; and encasement.
  2. The scope of work to complete a Quality Level C shall include all tasks from Level D and as a minimum must address the following additional tasks:

- (i) Identification of Surface Utility Features - identify surface features, from project topographic data (if available) and from field observations that are surface appurtenances of subsurface utilities.
- (ii) Identification of Aerial or Ground-Mounted Facilities - include survey and correlation of aerial or ground-mounted utility facilities in Quality Level C tasks.
- (iii) Utility Survey and Verifications - surveys of subsurface utility facilities or systems shall also include (in addition to subsurface utility features visible at the ground surface), determination of invert elevations of maintenance holes and vaults; sketches showing interior dimensions and line connections of such maintenance holes and vaults; any surface marking denoting subsurface utilities, furnished by utility owners for design purposes. Survey surface features of subsurface utility facilities or systems, if such features have not previously surveyed and carry out verification checks on previous survey data for accuracy and completeness.
- (iv) Confined Space Procedures - confined entry procedures (including but not limited to maintenance holes, vaults, and pipes, etc.), are to comply with City of Toronto applicable procedures and requirements contained within the City of Toronto, Health and Safety Policy.
- (v) Correlations, Interpretations and Presentation of Data Resolution of Discrepancies - exercise professional judgment to correlate data from different sources, and to resolve conflicting information. Update (or prepare) plan sheets, electronic files, and/or other documents to reflect the integration of Quality Level 'D' and Quality Level 'C' data. Recommend follow-up investigations (e.g., additional surveys, consultations with utility owners, etc.) as may be required to further resolve discrepancies and conflicts. As appropriate amend the indicated quality level of depicted information.

3. The scope of work to complete a Quality Level B shall include all tasks from Level D through C and as a minimum must address the following additional tasks:
  - (i) Line Detection and Marking - select/apply appropriate surface geophysical method(s) to search for and detect subsurface utilities within the project limits, and/or to trace a particular utility line or system. In conjunction with the City of Toronto standards and based on an interpretation of data, mark the indications of utilities and label individual utility information on the ground surface, for subsequent survey. Unless otherwise directed, mark centerline of single conduit lines, and outside edges of multi-conduit systems. As an alternative to the physical marking of lines, the Consultant may, with City of Toronto approval, utilize other means of data collection, storage, retrieval, and reduction, which enables the correlation of surface geophysical data to the project's survey control.
  - (ii) Survey - Survey all markings that indicate the presence of a subsurface utility. Perform surveys to a horizontal accuracy consistent with applicable City of Toronto survey standards. Reference surveys to the project's survey control. Record depth information of utility, which is indicated by the particular detection method, used. Clearly identify the means used to estimate depth, and the estimated level of accuracy.
  - (iii) Correlations, Interpretations and Presentation of Data Resolution of Discrepancies - exercise professional judgment to correlate data from different sources and to resolve conflicting information. Update and/or prepare plan sheets, electronic files, and/or documents to reflect the integration of Quality Levels D, C, and B data. Recommend follow-up investigations (e.g., additional surveys, consultation with utility owners, etc.) as may be needed to further resolve discrepancies. As appropriate, amend the indicated quality level of depicted information.
  - (iv) Certified as to accuracy by a licensed Professional Engineer. All drawings and reports must be stamped and signed.
4. The scope of work to complete a Quality Level A shall include all tasks from Levels D through B and as a minimum must address the following additional tasks:
  - (i) Selection of Test Locations - City of Toronto may require Quality Level A data where the precise horizontal and vertical location of utilities, obtained by exposure and survey of the utility at specific points, is needed for conflict assessment and/or resolution purposes. The Consultant may recommend test locations based on the requirements of the project and on existing subsurface utility information.
  - (ii) Selection of Method - The Consultant shall use minimally intrusive excavation techniques, acceptable to the City of Toronto, where utility lines must be exposed and surveyed at specific locations that ensure the safety of the excavation, the integrity of the utility line to be measured as well as other lines, which may be encountered during excavation. The Consultant will ensure excavation shall be by means of air or water assisted vacuum excavation equipment manufactured specifically for the purpose. No other means of mechanical excavation shall be allowed.
  - (iii) Excavation of Test Holes - clean the test hole area of surface debris. In hard surface areas, neatly cut and remove existing surface, cut not to exceed 0.15 square meters unless otherwise approved. Excavate test hole by method(s) approved by the City of Toronto and to the applicable standards. The nominal

diameter of the test hole shall not exceed 375 mm unless otherwise approved. Expose the utility only to the extent required for identification and data collection purposes. Avoid damage to lines, wrappings, coating, and cathodic protection or other protective coverings and features. Hand dig as needed to supplement the excavation and to ensure safety of personnel and buried plant. Revise test hole location as necessary to positively expose the utility.

- (iv) Collection, Recording and Presentation of Data - measure and/or record the following information on an appropriately formatted test hole data sheet that has been dated and professionally sealed by Consultant. Elevation at top and/or bottom of the utility tied to the project datum, to a vertical accuracy of  $\pm 15$  mm. Elevation of existing grade over utility at test hole. Horizontal location of utility referenced to project coordinate datum, to a horizontal accuracy consistent with applicable City of Toronto survey requirements. Field sketch showing horizontal location referenced to a minimum of three (3) swing ties to physical structures existing in the field and shown on project plans. Approximate centerline bearing of utility lines. Nominal diameter of pipe, width of duct banks and configuration of non-encased multi-conduit systems. Utility structure material composition, when reasonably ascertainable. Identity of benchmarks used to determine elevations. Ascertain and note condition of utility. Pavement thickness and type when applicable. Soil type and site conditions. Identity of utility owner/operator. Other pertinent information as is reasonably ascertainable from test hole.
  - (v) Site Restoration - replace bedding material around exposed utility lines in conformance with owner's specifications or as otherwise directed or approved. Backfill and compact excavated material in accordance with City of Toronto requirements. Re-install color-coded warning ribbon within the backfill area and directly above the utility line. Supply/install permanent surface marker (e.g. P.K. nail, peg, steel pin, or hub) directly above the centerline of the structure or edge of structure for duct banks and record elevation of marker. Backfilling / surface restoration shall conform to the City of Toronto's Municipal Consent Requirements for the Installation of Plant within City of Toronto Streets.
  - (vi) Interpretations of Data and Resolution of Discrepancies - provide professional expertise to correlate multi-sourced data and to resolve conflicting information. Update plan/profile sheets, electronic files, and/or other documents to reflect the integration of Quality Levels D, C, B and A data. Recommend follow-up investigations (e.g., additional surveys, consultation with utility owners, etc.) as may be needed to further resolve discrepancies. As appropriate, amend the indicated quality level of depicted information.
  - (vii) Certified as to accuracy by a licensed Professional Engineer. All drawings and reports must be stamped and signed.
5. The SUE Quality Level performed for each utility must be indicated on plan and/or profile engineering drawings.

### **A.2.3 Engineering Survey**

#### **2.3.1 The Consultant will be required to perform the following:**

1. Provide a complete Engineering Survey within the road allowance for the preparation of engineering drawings. The Engineering Survey shall be a full topographical survey with 0.005 of a metre accuracy, from property line to property line for the entire length of the proposed assignment locations and, as a minimum, provide the information detailed in

Appendix A-4 and the City Engineering Survey Standards. The successful proponent will be provided with legal surveys related to the pertinent road allowances.

2. The Engineering Survey shall follow good survey practice such as obtaining elevations at least every 20 metres if a more stringent requirement is not identified in Survey Standard (i.e. alignment changes, low points, etc.)
3. The surveyors must have the capacity, both labour and experience, to provide engineering survey, as required for this program. The Party Chief must have at least five (5) years of related experience.
4. Engineering Survey is to be included as part of the base scope of work for Data Collection.
5. The Engineering Survey is to be tied to the City's geodetic datum, horizontal and vertical control points, which will be provided by the City at the Consultant's request.
6. The Engineering Survey shall conform with the City's "Engineering Survey Standards for Consultants" and "Engineering Survey Microstation V8 Graphic Specification" (City's Survey Standards) and shall indicate the appropriate CAD layers, symbols, and standard nomenclature, etc. that are to be used for all drawings. **All costs borne by the City to correct or modify submitted drawings so that they conform to the survey standards shall be deducted from the overall Consultants fees of the assignment.**
7. Upon completion of the Engineering Survey and processing, the Consultant shall complete a quality control, utilizing the City provided spec checker, to ensure compliance with the City Survey Standard and provide the City with a certificate of conformance (spec checker text log).

2.3.2 The consultant will be required as part of the scope of work to perform a complete Engineering Survey within the road allowance which shall as a minimum provide the following information:

8. Confirm location and elevations of all curb, curb and gutter, medians, sidewalks, driveways, bike paths, ditches, pavement markings and other road features.
9. Confirm location of all utility surface features.
10. Confirm location of all shrubs, planting beds, trees including species, diameter of trunk, and drip line, and any other landscaping feature such as berms etc.
11. Confirm location and size of all bus shelters, benches, planters and other street furniture.
12. Confirm invert elevations and sizes of all affected sewers and watermain or those that may cause conflicts, if applicable.
13. Confirm top of lid elevations for all maintenance holes, catchbasins, valve chambers, valve boxes, and all other service structures.
14. Confirm location and elevation of all fire hydrants.
15. Confirm type, location and height of retaining walls and fences.
16. Confirm surface materials (e.g. asphalt, concrete, pavers, sod, etc.)
17. Any other surface features that may affect constructability or have a significant impact on construction/restoration costs.

2.3.3 Rationalization of Source Mapping Data Sets

2.3.3.1 The following table identifies the file data sets that the Consultant shall obtain from the City, for integration and the development of a composite base plan of existing conditions. Each of the following data sets will need to be compiled and verified to develop the composite



base map, this mapping will be used by the Consultant for planning purposes (i.e. utility circulations) until the engineering field survey is integrated, finalizing the baseplan.

## Rationalization of Source Data Sets for Design

Source Data Set	Reference File per Data Source and Content	File is Referenced to Design Drawing Files
<b>Data Sets from Capital Works Download</b>		
1. Address	Available in all Districts and elements in file shall be altered and moved as required for drawing clarity and copied into the Property Street Line (PSL) reference file in conformance with the City's CADD Specification Manual PSL level designations. (This information is reliable and accurate).	YES
2. Parcel	Available in all Districts and elements in file shall be altered and moved as required for drawing clarity and copied into 'PSL' reference file in conformance with the City's CADD Specification Manual PSL level designations. (This information is reliable and accurate).	YES
3. Enterprise Stereo Model (ESM) – Aerial Topographic Mapping	Available in all Districts for preliminary design as a reference file. This data set is secondary to any redundant features identified in engineering survey. The accuracy of this planimetric data is approximately +/- 0.50 metres and is superseded by the Consultant's Engineering Survey data. Subsequently, line work is required to be modified in order to transition and meet survey related features. Cells and line styles are at 1:500 scale and are required to be converted to adhere to a 1:200 scale design environment. This information is to be used for planning purposes and to supplement the information outside the survey boundaries (street line to street line).	YES
4. Toronto Water Division Sewer and Water network data	This information is available in all Districts and is used as a source of existing City infrastructure and any discrepancies between this data and surveyed information shall be resolved by the Consultant. This data is available in all areas except the former City of Toronto, where DMOG is used. This data set shall not be copied onto the Underground Services (UGS) reference file but re-scribed into the USG in conformance with the City CADD Specifications Manual.	NO

Source Data Set	Reference File per Data Source and Content	File is Referenced to Design Drawing Files
5. DMOG - (Digital Map Owner's Group) Utility Mapping	<p>Utility information on underground levels is copied into 'UGS' reference file and must be converted by the consultant to conform to the City's CADD Specification Manual UGS level designations. A conversion tool will be provided to the consultant at the outset of the program. (Note: This data set should be used only to validate other data sources and has not been verified by the City). This data is available to all Districts; however, this only pertains to projects located within the former City of Toronto limits.</p> <p>In addition, surface feature levels (planimetrics) from this data set are not used and have the lowest priority of data integrity. Therefore, underground utility and related data shall be modified and adjusted to fit with Engineering Survey data. Text and elements that form part of this reference file are required to be altered and moved as necessary for drawing clarity.</p> <p>Updated Utility Data obtained from other sources, shall be added to this reference file in conformance with the CADD standards Multi-line definitions.</p> <p>Any identified Easement (EAS) information series shall be placed in the 'PSL' or 'EAS' reference file(s). Easement info. series are in the PSL reference files</p>	YES
<b>Imagesite Data</b>		
Historic Plan and Profile information	This information is used as a source of existing City infrastructure and validated through Subsurface Utility Engineering (SUE), Utility circulation mark-ups and or engineering surveys.	NO
<b>Laserfiche Servicing Data</b>		
Sewer and Water Services data (cards scan or hard copy by address)	Servicing data to be manually inputted into Design reference file and in conformance with the City's CADD Specification Manual.	NO
SUE Data	SUE file is used as a resource data set necessary for both validating existing utilities and updating utility data. If required, SUE data is copied into 'UGS' reference file in conformance with the City's CADD Specification Manual UGS level designations.	YES
Utility Mark-ups	This information is used to inform and obtain utility comments on existing utility infrastructure data and co-ordinate any planned utility work. Any identified differences shall be resolved by the Consultant.	NO
Engineering Survey (To be provided by the Consultant)	The engineering survey file is referenced and replaces all other source and/or underlying features. It also is the	YES

Source Data Set	Reference File per Data Source and Content	File is Referenced to Design Drawing Files
	reference file used to complete the re-alignment of all other source data with connecting and adjoining features. Survey levels are not to be copied into any Design File.	

2.3.3.2 Upon acceptance of the Engineering Survey by the City, the Consultant shall proceed with rationalizing the preliminary base plan with the engineering survey. All base plan and design drawings must meet the requirements of the City's CADD Specification Manual.

2.3.3.3 Upon completion of rationalization and preparation of the base plan, the Consultant shall complete a quality control, utilizing the City provided spec checker, to ensure compliance with the City CADD Specifications Manual and provide the City with a Certificate of Conformance (spec checker text log).

#### A.2.4 Geotechnical Investigation

If the Request for Proposal indicates that the City will separately retain the geotechnical services, Initiate and co-ordinate all work associated with the sub-surface investigation including:

1. Identify areas to be investigated based on the review of the existing reports and the proposed land use
2. Prepare the terms of reference for a sub-surface investigation in compliance with the City's standards
3. Review the quotations and recommend a specialized firm to be retained by the City
4. Administer all work undertaken by the selected firm
5. Incorporate the recommendations in the relevant reports

Allow for a minimum of eight weeks for the City to retain these services.

2.4.1 Unless specifically instructed in the Request for Proposal that the City will conduct the geotechnical investigation, the consultant will be required as part of the scope of work to conduct geotechnical investigations and prepare reports for each of the proposed assignment locations. The Consultant will be responsible for all asbestos testing, classification of subsoil, water table monitoring, chemical analyses of in-situ soils to determine excavated soil disposal requirements, suitability as fill material and necessary engineering properties that may have an impact on design and construction of the assignment and as a minimum comply with the following requirements:

2.4.2 If the Consultant undertakes the drilling of boreholes itself, then it shall be designated the "constructor" for the purposes of OHSA and shall assume all of the responsibilities and carry out all of the duties of a constructor as set out in OHSA and its regulations. Any agreement the Consultant enters into with a person who undertakes the drilling of boreholes (the "driller"), or with another consultant who retains a driller, shall designate the "constructor" for purposes of the OHSA, and shall require the driller to assume all of the responsibilities, and carry out all of the duties of a constructor as set out in OHSA and its regulations. For greater clarity, in no circumstances will the City undertake the drilling of boreholes and it shall assume none of the responsibilities of a constructor in relation thereto.

#### 2.4.3 General Requirements

2.4.3.1 Supply all labour, equipment and materials, necessary to complete the soil borings, including packaging and delivery of samples and submission of reports as specified herein.

- 2.4.3.2 Arrange for stake out of all underground utilities and obtain the necessary road occupancy permits prior to commencing work.
- 2.4.3.3 Continuously employ not less than three workers on any one boring machine, including a drilling foreman experienced in both soil and rock drilling and sampling, an assistant, and a flag person to direct traffic. Consultant shall provide his own technician with the appropriate experience in field supervision and sample preparation.
- 2.4.3.4 The final location of each borehole should be reported in the borehole log with reference to an easily identifiable object on the street, such as house number or measurement from the nearest road intersection. The location of the borehole should also make reference to which travelled lane of a roadway the borehole is situated. Furthermore, the Consultant shall prepare a key plan as part of the geotechnical investigation report for each assignment location and include three tie-in measurements per borehole from permanent structures in the vicinity, with offset from curb lines.
- 2.4.3.5 In the event that bedrock is encountered, continue the borehole into the bedrock for a depth of 3 metres.
- 2.4.3.6 Designated substance testing must be carried out as part of the geotechnical Investigation and findings must be identified in the report.
- 2.4.3.7 Consultant shall perform the Standard Penetration Resistance test to determine and record the number of blows, of a 65 kg hammer, falling 760 mm, required to drive a 50 mm diameter split spoon sampler 300 mm into the material. Do this for every 750 mm of depth and near the top of each layer of new material. Record the relative elevation of the above tests.
- 2.4.3.8 Consultant to note and log the type of soil at various levels from the datum provided by the City's Project Manager, to the depth of the borehole, or from road/ground surface as specified. Take the first sample before the hole is 250 mm deep, and the second sample between 250 mm and 1000 mm depth. Thereafter take samples with a sampling spoon of approved type, every 750 mm, and at every level where there is a change in character of the soil. Immediately upon removal from the hole, samples shall be tightly sealed in air tight containers, to be supplied by the Consultant. Take care to ensure all fine materials are retained and that materials are well mixed and truly representative of the soils to be encountered during construction. Assemble samples separately for each hole, and label to give a complete record of each boring, including names of assignments, order number, hole number and depth at which the sample was taken.
- 2.4.3.9 Pavement investigations to address the permeability of the sub-grade materials are to be performed to facilitate drainage design. The permeability of the sub-grade shall be estimated by comparing the particle size distribution of the material with the established permeability correlation data. Combined sieve and hydrometer analyses shall be carried out on representative samples of the sub-grade material(s) to obtain the particle size distribution curves for comparison.
- 2.4.3.10 During the field investigation works, Consultant to provide, erect and maintain all requisite barriers and fences, or build proper protection, provide, keep and maintain watchperson and warning lights as specified by the City of Toronto, to ensure safety to the public as well as those engaged on or about the work, without further order or expense.
- 2.4.3.11 Upon completion of the works, remove all piping, temporary structures, garbage and waste materials and restore ground surface to its previous conditions. Refill each borehole immediately after its completion, with cement grout (1:3 cement sand mortar mixed dry and tamped in). Test pits to be backfilled in accordance with City Standard TS 4.60:

Construction Specification for Utility Cut and Restoration. Restoration must be satisfactory to the City.

#### 2.4.4 Base Scope

The Consultant will be required to perform the following as part of the base scope of work unless otherwise indicated:

- 2.4.4.1 Conduct geotechnical investigations and prepare reports for each of the proposed assignment locations.
- 2.4.4.2 The geotechnical investigations shall be supplemented as required with additional explorations to verify consistent conditions within a critical component zone and/or as recommended by the Consultant and approved by the City. Additional boreholes may be required to confirm conditions if two adjacent boreholes show differing information.
- 2.4.4.3 Prepare borehole plans for each assignment location, obtain permits as required for soil investigations, co-ordinate and perform/supervise soil environmental investigation activities in the field and incorporate all necessary soil and disposal practices and procedures required by the regulatory agencies into the contract documents.
- 2.4.4.4 The Consultant shall select the location of boreholes to avoid conflict with above or underground utilities, distribute boreholes evenly across the entire length of the assignment location, and cover all the traveled lanes.
- 2.4.4.5 Where boreholes or test pits are located near or on public roads, the Consultant will be required to arrange the geotechnical investigation equipment so as to provide minimum inconvenience to traffic and to conform to the traffic requirements.
- 2.4.4.6 Consultant to keep a continuous log of materials encountered during the sinking of each borehole. All sample descriptions in the report shall follow the Canadian Foundations Engineering Manual soil classification system.
- 2.4.4.7 Piezometers are to be installed in boreholes that are not dry upon completion of drilling. Water inside a borehole should be pumped out before a piezometer is installed prior to backfilling. The Consultant is responsible disposing of the surplus water. Consultant should return to the site to record the free standing ground water level inside the borehole after 24 hours. Each piezometer assembly shall include a proper piezometer tip, an appropriate length plastic tubing of 12.7 mm outside diameter, couplings, and protective plastic caps.
- 2.4.4.8 The type and quantity of laboratory tests for each assignment location shall be determined by the Consultant to ensure the required geotechnical information is obtained to successfully complete the design and construction works.
- 2.4.4.9 When a pervious storm sewer system is identified in the scope of an assignment, in situ infiltration tests are to be performed in a separate 5.00 metre deep borehole by inserting a perforated casing with the top 1.5 m perforations being blocked off. Fill the hole with water and measure the time required for the water to infiltrate into the soil.
- 2.4.4.10 Consultant to undertake soil chemical analysis for each of the proposed assignment locations.
- 2.4.4.11 Where required, asphalt cores shall be analyzed to determine asbestos content as per O. Reg. 278/05 utilizing the U.S. Environmental Protection Agency Test Method EPA/600/R- 93/116: Method for the Determination of Asbestos in Bulk Building Materials (June 1993). Consultant shall review the City's Asbestos Locations map to determine if asbestos analysis of cores are required. Asbestos analysis shall be typically done on a composite of all asphalt layers found in a core sample. If asbestos is detected in the composite sample or if asbestos is already suspected in a specific layer, then separate

analysis of each

distinguishable asphalt layer may be required. Asbestos concentrations shall be reported as a percent by weight to less than 0.25% asbestos content and shall include an indication of the asbestos fibre type. Asbestos fibre analysis shall be done using polarized light microscopy (PLM). Asbestos fibre analysis method shall be based on EPA 600 or approved equivalent.

2.4.4.12 At a minimum, provide recommendations to address following:

2.4.4.12.1 Soil classification(s)

- 2.4.4.12.2 Borehole logs
- 2.4.4.12.3 Grain size analysis curves
- 2.4.4.12.4 Type and quality of bedrock (if encountered)
- 2.4.4.12.5 Depth of overburden
- 2.4.4.12.6 Ground water elevation(s)
- 2.4.4.12.7 Soil proctors for overburden material
- 2.4.4.12.8 Bearing capacity of soils
- 2.4.4.12.9 Pipe bedding (materials) requirements with respect to City's standards;

2.4.4.12.10 Dewatering requirements describing available methods including well points, if required;

2.4.4.12.11 Recommendations relative to bedrock blasting and removal, if required;

2.4.4.12.12 Recommendations for open cut excavation, type of shoring system, methods of tunneling, or jacking and boring;

2.4.4.12.13 Recommendations on the use of native backfill, placement depth of layers, and compaction specification for same;

2.4.4.12.14 Recommendations for soil parameters to be used for calculation of trust blocks and restrained joints (including coefficient of friction, shear angle, and bearing capacity);

2.4.4.12.15 Evaluation of pertinent soils characteristics (resistivity of the soil, as in-situ and fully moistened, chloride ion concentration, pH corrosivity, etc.) and the implications with respect to the proposed subsurface infrastructure, if applicable.

2.4.4.12.16 Concerns in relation to trench bottom uplift; and,

(xvii) Recommendations on the disposal of the material off site based on the outcome of the chemical analysis of the soil.

2.4.4.13 Geotechnical Investigation Report

2.4.4.13.1 Environmental Site Assessment chemical analysis of representative soil samples as outlined in the Ministry of Environment, Conservation and Parks (MECP) Criteria for use at Contaminated Sites in Ontario (General and Inorganic) and the MECP Regulation 347. The chemical analysis is intended to address any qualitative concerns for materials disposed offsite. Make recommendation on the disposal of the material off site based on the outcome of the chemical analysis of the soil.

2.4.4.13.2 All findings from the geotechnical investigation, including borehole log report, chemical analyses results, comments and recommendations should be presented in an assignment by assignment or assignment grouping report



format. Recommendations shall include a cost effective life cycle pavement design based on the City's Pavement Structural Design Guideline and suitability of materials for backfilling purposes. Traffic volumes (AADT) required for the pavement design will be supplied by the City.

2.4.4.13.3 For each geotechnical investigation, the Consultant shall submit to the City's Project Manager two (2) separate reports, a factual report and a recommendations report.

2.4.4.13.4 Any extra costs borne by the City which are determined to be attributed to inadequate geotechnical information (such as boreholes not extended at a minimum to the depth of proposed works, sufficient chemical analysis or asbestos testing to minimize costs during construction, identifying dewatering requirements, etc.) shall be deducted from the Consultant's overall fee for the assignment.

2.4.4.13.5 The Consultant to confirm the activities related to boreholes and boreholes preparation confirm with OHS requirements, including but not limited to, how it pertains to the requirement of the Constructor.

#### 2.4.5 Borehole Log Report

All sample descriptions in the report shall follow the Canadian Foundations Engineering Manual soil classification system. The borehole log report, among other relevant information, shall include the following:

- (i) Project description, location, date and time of test and drill type.
- (ii) Detail description of the types of soil encountered, their soil classifications and depths and delineate soil stratigraphy in accordance with the Ministry of Transportation of Ontario's Soil Classification System.
- (iii) Record the thickness of asphalt and/or concrete and granular road base in the borehole log report, where boreholes are located within an asphalt or concrete roadway.
- (iv) Describe colour, consistency and or wetness of soil.
- (v) Make specific note of soil colour stains, odours where present and any metal, wood, debris or organic materials encountered. Record any observations that indicate contamination of excavated material with petroleum products, garbage or other wastes.
- (vi) Record N values from Standard Penetration Tests and penetration depth of split spoon sampler.
- (vii) Record ground water and free standing water table in the borehole upon completion of boring and after 24 hours.
- (viii) Report cave-in depth if cave-in occurs.
- (ix) Describe the type and hardness of bedrock if encountered.

#### 2. Soil Chemical Analysis

- (i) Consult with MECP and/or TRCA staff and develop a work program to analyze and classify the material, which is intended for excavation during construction. The proposed work program must be satisfactory to MECP and/or TRCA staff. The work program may include only analysis of existing soil samples and/or collection and analysis of additional soil samples as considered appropriate to the site and project at hand.

- (ii) Conduct sufficient laboratory analysis to classify soil samples for landfill disposal options in accordance with ILQCP and MECP guidelines.
  - (iii) Prepare a final report outlining the work program undertaken; test results; and commenting on the suitability of excavated material for landfill disposal or alternative landfill disposal options consistent with Ontario Regulations 558 and MECP guidelines for disposal at a licensed landfill.
- 3. Infiltration Test
  - (i) If required, in situ infiltration tests are to be performed in a separate 5.00 metre deep borehole by inserting a perforated casing with the top 1.5 m perforations being blocked off. Fill the hole with water and measure the time required for the water to infiltrate into the soil.
  - (ii) Soil percolation rates are to be measured in each borehole. Soil percolation rates are to be measured in the depth range of approx. 1.2m to 3.5m. Infiltration testing shall be done to assess suitability of area for pervious catch basins. Recommendations are to be provided concerning suitability of soils for infiltration as per MECP guidelines.

#### **A.2.5 On-Site and Excess Soil Management**

- 6. Review project design options and prepare a preliminary estimate of excess soil volume.
- 7. Report on alternative to minimize excess soil generated during the project.
- 8. Review the available exemptions for infrastructure projects and public bodies and describe their application to the project where appropriate.
- 9. Retain the services of a Qualified Person to ensure the compliance with Ontario Regulation 406/19 *On-Site and Excess Soil Management*, the Soil Rules and other applicable legislation.
- 10. Review the project area(s) and, in the case of multiple project areas, provide a description of how each area will be investigated and characterized.
- 11. Unless exempt under Schedule 2 of O. Reg. 406/19, complete an Assessment of Past Uses and Sampling and Analysis Plan, if applicable.

#### **A.2.6 Noise Study**

- 12. The Consultant shall retain the services of a specialized firm to conduct a noise study in compliance with NPC and the City of Toronto Municipal Code.
- 13. If the Request for Proposal indicates that the City will separately retain the noise study services, the Consultant shall initiate and coordinate all work associated with the noise study as follows:
  - (a) Identify areas to be investigated based on the location of the structure(s)
  - (b) Prepare the Terms of Reference for a noise investigation in compliance with the City's standards
  - (c) Review the quotations and recommend a noise consultant to be retained by the City
  - (d) Administer all work undertaken by the noise consultant
  - (e) Incorporate the recommendations and ensure implementation of noise attenuation measures, as required.

**Allow for a minimum of eight weeks for the City to retain these services.**

#### **A.2.7 Traffic Requirements**

14. Traffic Management Plans must be prepared and implemented, as approved by the City, whenever movement of traffic or traffic safety is impacted by the Consultant's operations. The Traffic Management Plan shall conform to the Ministry of Transportation – Ontario Traffic Manual Book 7 – Temporary Conditions. Additionally, all traffic signage shall be in accordance with City of Toronto/Ministry of Transportation requirements, the requirements of the Manual of Uniform Traffic Control Devices, Construction Specification for Maintenance of Traffic TS1.00.
15. Review alternatives for maintaining vehicular and pedestrian traffic during construction. The final plans for traffic control and construction staging must be developed in consultation with the City's Traffic Operation Section, Project Delivery – Linear & Structures, and other stakeholders at the pre-design phase and be included in the Pre-Design Report.
16. Materials and equipment must be confined to one side of the street only and stored so as not to interfere with visibility and/or corner movements.
17. Sidewalks access shall maintain a minimum 1.5m width at all times. However, if sidewalks must be blocked, pedestrians shall be directed to the other sidewalk on the opposite side of the road with proper signage.
18. Satisfactory facilities for pedestrians crossing at corners must be provided.
19. Provide flag persons to guide pedestrians and vehicular traffic when required.
20. Maintain access to all streets at all times.
21. Comply with conditions of the Road Occupancy Permits such as meeting with the Work Zone Traffic Coordinator when required and issue RODARS lane restriction notifications.
22. As a general guideline, pay duty police are required during any construction activity carried out within 30 metres of a signalised intersection, in signalised intersections when the left turn has been eliminated and/or turning movements cannot be made in a safe manner, at signalised intersections when pedestrian movements cannot be made safely due to the construction, or whenever there is a need to direct or stop two (2) lanes of traffic flowing in the same direction or opposite directions. Two (2) pay duty police officers shall be required to be present during the installation, relocation and/or removal of traffic control signs and delineators on any arterial roadway. Whenever towing services are required, a pay duty police officer must be present to direct and control this operation.

**END OF APPENDIX A.2**